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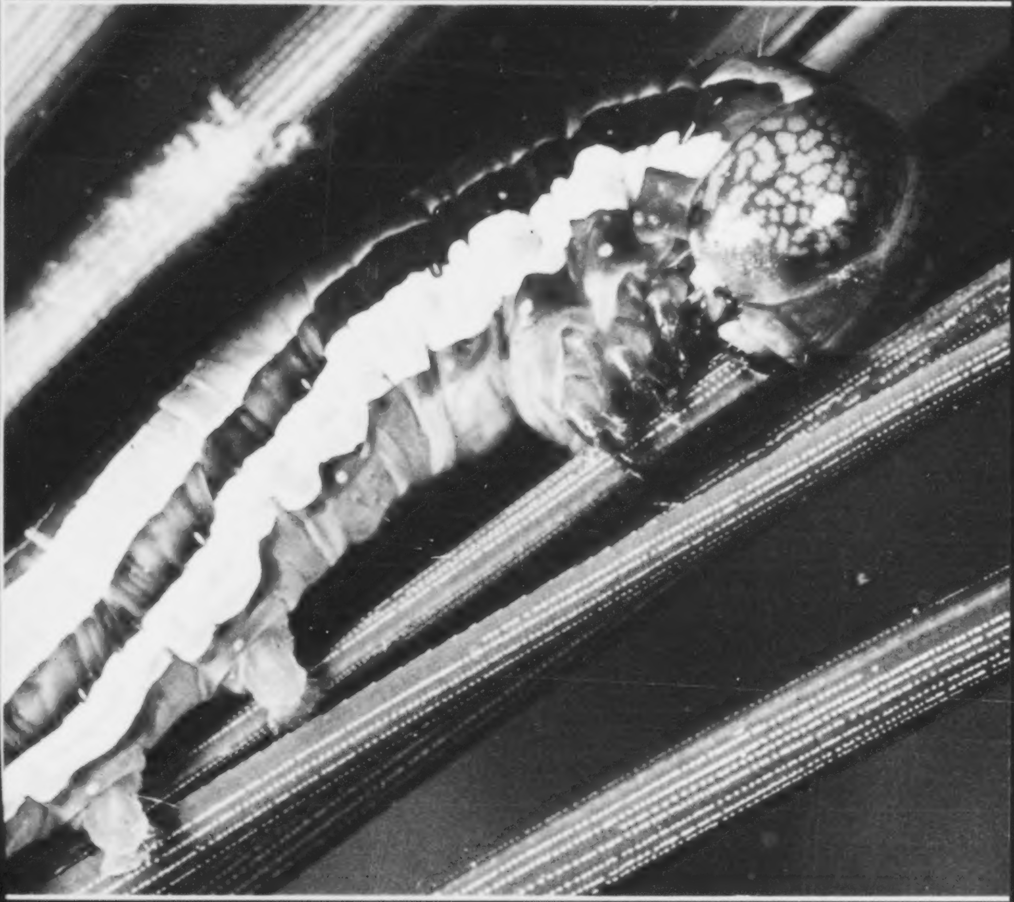
Conifer Defoliators of British Columbia

Robert W. Duncan



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Conifer Defoliators
# of British Columbia

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Robert W. Duncan

Natural Resources Canada
Canadian Forest Service
Pacific Forestry Centre
Victoria, British Columbia

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Forest Investment Account of the Government of British Columbia
Forest Science Program

Natural Resources Canada
Canadian Forest Service

Pacific Forestry Centre
506 West Burnside Road
Victoria, British Columbia
V8Z 1M5
Canada

Phone (250) 363-0600

www.pfc.cfs.nrcan.gc.ca

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For the more than 70 Forest Insect and Disease Survey rangers
who diligently collected and documented the forest defoliators
of British Columbia from 1936 to the program's end in 1995.
Their efforts provided much of the host, distribution and
damage information reported here.

About the author

For more than 30 years, Robert W. (Bob) Duncan provided forest insect diagnostic services for the Canadian Forest Service and its collaborating agencies in British Columbia and the Yukon Territory. His knowledge of the forest insects of British Columbia is extensive—much of it gained through his long and close working relationship with the Canadian Forest Service's Forest Insect and Disease Survey unit. Every year, from 1936 to 1995, the unit's rangers conducted surveys and published reports. These records provide a valuable archive of insect and disease conditions in British Columbia's forests throughout the past 6 decades.

Acknowledgments

This work could not have been completed without the help of collaborators. Foremost among these is Dion Manastyrski, who assisted the author in making field collections of larvae, worked diligently to preserve the exquisite quality of images in this publication, provided photographic advice, and took many of the photographs.

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Introduction

Magnificent coniferous forests cloak all but the highest peaks and most arid interior valleys of British Columbia. Conifers are dominant in each of the province's varied forest ecosystems, from the warm temperate coastal rainforest to the subarctic boreal forest. They also grow as scattered individuals in the harsh environments of the South Okanagan's Great Basin desert and in high-elevation alpine meadows buried in deep snows for much of the year. Of the 32 species of conifers native to Canada, all but seven occur in British Columbia. Conifers account for more than 90 percent of the province's forest cover and contribute significantly to the province's economic health and aesthetic appeal.

This book is about the forest defoliators—insects that consume conifer foliage—that live within these forests. It provides near-comprehensive coverage of the conifer-feeding caterpillars and sawfly larvae of British Columbia. Larval descriptions, life history data, color photographs and a photographic key are provided to help users identify any defoliator occurring on a coniferous host in British Columbia, and quickly locate information on the distribution, hosts, biology, abundance, feeding habits, and economic impact of each species in this important group of insects.

These insect defoliators are important elements of forest health and biodiversity. Some species periodically go into outbreak, and denude thousands of hectares of forests, reduce the forests' aesthetic and recreational appeal, and cause considerable economic loss to the forest resource through lost growth and tree mortality. Other species are rare and may require conservation efforts. All play important ecological roles in the forest.

The 175 species of forest defoliators described herein include almost all the species known to feed on conifers in British Columbia. Despite the best efforts of the author and others involved in this project, about 10 defoliator species known to occur in British Columbia were not collected, photographed and identified in time to be included in this edition. Information about and images of these species will be published on the project website (**www.pfc.cfs.nrcan.gc.ca/entomology/defoliators/**) as the species are found, reared and identified, and will also be included in subsequent editions of this guide.

Although the geographic coverage for this guide is British Columbia, many of the species included occur throughout much of the western cordillera.

It is hoped that the images and information presented in this guide will foster an improved appreciation and understanding of the forest caterpillars and sawfly larvae of British Columbia, and will help the reader recognize that, although a small fraction of these insects cause significant damage to the forests, most defoliator species are harmless, and perform many vital ecological functions in our forests.

Introduction

La Colombie-Britannique est un coin de pays caché dans de magnifiques forêts de conifères. Tout, sauf les pics les plus élevés et les vallées intérieures les plus arides, est recouvert de forêts. Les conifères dominent chacun des écosystèmes forestiers de la province—de la chaude forêt ombrophile tempérée à la forêt boréale subarctique. Ils croissent même dans les milieux désertiques austères du grand bassin de l'Okanagan Sud ainsi que dans les prairies alpines en altitude enfouies sous la neige la plus grande partie de l'année. Des 32 essences de conifères indigènes au Canada, seulement 7 ne se trouvent pas en Colombie-Britannique. Ces 25 espèces indigènes qui se trouvent en Colombie-Britannique comptent pour plus de 90 % du couvert forestier de la province. Elles procurent ainsi à cette dernière l'essentiel de ses attraits esthétiques et sont gage de sa santé économique.

Le présent ouvrage traite des défoliateurs des essences forestières—des insectes qui mangent le feuillage des conifères—vivant dans ces forêts. On y trouve une couverture quasi exhaustive des chenilles et des larves de tenthrèdes se nourrissant aux dépens des conifères de la Colombie-Britannique. La description des larves, des données sur le cycle de vie, des photographies en couleurs et des clés assorties d'images sont fournies afin d'aider les utilisateurs à identifier n'importe quel défoliateur à l'œuvre dans un conifère hôte en Colombie-Britannique. Ces éléments permettent également de trouver rapidement des renseignements au sujet de la répartition, des hôtes, de la biologie, de l'abondance, des habitudes alimentaires et de l'impact économique de chaque espèce de cet important groupe d'insectes.

Ces insectes défoliateurs représentent des éléments importants de la santé des forêts et de la biodiversité. Certaines espèces d'insectes infestent périodiquement les forêts et peuvent dénuder des milliers d'hectares de forêts, en réduire les attraits esthétiques et récréationnels de même que causer des pertes économiques considérables à la ressource forestière en raison de la croissance progressive interrompue et de la mortalité chez les arbres. D'autres espèces sont rares et peuvent nécessiter des mesures de conservation. Elles jouent toutes des rôles écologiques importants dans la forêt.

Les 175 espèces de défoliateurs forestiers décrits dans le présent ouvrage comprennent la plupart des espèces connues pour se nourrir du feuillage des conifères en Colombie-Britannique. Malgré les efforts de l'auteur et d'autres personnes participant à ce projet, environ 10 espèces de défoliateurs qu'on sait se trouver en Colombie-Britannique n'ont pu être recueillies, photographiées et identifiées à temps pour accompagner la présente édition. L'information au sujet de ces espèces et les photographies les illustrant seront publiées sur le site Web du projet, à l'adresse **www.pfc.cfs.nrcan.gc.ca/entomology/defoliators/**, à mesure qu'on trouvera les espèces et qu'elles seront traitées et identifiées, et elles seront également ajoutées dans les éditions à venir du présent guide.

Même si la couverture géographique utilisée pour ce guide est la Colombie-Britannique, nombre des espèces décrites se trouvent à peu près partout dans la cordillère occidentale.

Introduction

Il est à espérer que l'information et les illustrations présentées dans le présent guide favoriseront une meilleure compréhension des chenilles et des larves de tenthrèdes de la Colombie-Britannique. Il est également à espérer que l'ouvrage aidera les lecteurs à reconnaître que, bien qu'une petite fraction de ces insectes causent des dommages importants aux forêts, la plupart des espèces défoliatrices ne font aucun mal; elles accomplissent de nombreuses tâches écologiques vitales dans nos forêts.

About this guide

Insects included

This book describes the caterpillars and sawfly larvae that feed on conifer foliage in British Columbia.

It does not include: alien species not currently established in British Columbia; adult defoliators (weevils, scarab beetles, grasshoppers); caterpillars often found on conifer foliage and assumed to be defoliators, but which actually feed on algae, fungi or detritus; or larvae of predators, such as syrphids, coccinellids and neuropterans, which may also be confused with defoliators. Images of species representative of all these groups except alien species are, however, provided for clarification in the photographic key.

Organization of insects

Defoliator species are organized systematically: first by order; then alphabetically by family, genus and species.

Identification of host plants

In order to identify any of the 25 species of conifers native to British Columbia, as well as most of the more common ornamental conifer species planted in the urban forest, see John Laird Farrar's *Trees in Canada* (Fitzhenry and Whiteside, 1995).

Readers' guide to species treatments

Hosts

Host trees are listed by frequency of a defoliator's occurrence on a host species, with the principal coniferous hosts listed first. Nonconiferous hosts are also indicated.

Each defoliator described in this guide feeds on one or more coniferous tree species. More than half (90) of these defoliator species feed on conifers within a single genus or species; another third (60) feed on species from several conifer genera; a few (20) feed on both coniferous and broadleaf hosts.

Although some conifer species or genera such as Douglas-fir or spruce are preferred hosts for many defoliators (>60) and occasionally suffer severe damage during widespread defoliator outbreaks, other conifers such as western redcedar, yellow-cedar and western yew are host to very few defoliators (<5) and seldom, if ever, support damaging outbreaks.

Distribution

Distributions provided for defoliator species are approximate. The principal sources for distribution data published in this guide are the collection records and associated voucher specimens of the Forest Insect and Disease Survey (FIDS) unit of the Canadian Forest Service, as well as label collection data extracted from specimens in the Canadian National Collection (CNC) and other collections. The distribution of the principal host(s) of each defoliator species also provided guidance. Distribution maps of coniferous hosts are provided.

Most defoliators (102) in this guide are restricted to the western cordillera. Almost a third of the species (53) occur in coniferous forests throughout much of temperate North America; a few (10) have a holarctic distribution, occurring in coniferous forests across the Northern Hemisphere. Few of the conifer defoliators known to occur in British Columbia are exotic species. All introduced conifer defoliators (8 spp.)—except the larch casebearer—currently established in British Columbia appear, at present, to be restricted to conifers planted as ornamentals in the urban forest.

Description

This section describes size, typical coloration and markings of a mature larva. For polymorphic species, photographs illustrate the range of color pattern variations. Images of mid-instar larvae are provided for those species in which the coloration and markings are distinctly different from those of final-instar larvae.

Bionomics

This section describes the life history and habits of each species. The description begins with the overwintering stage, and indicates at what time of year each life stage can be found. When known, additional information is provided on feeding habits, oviposition and pupation sites.

Damage

Locations and dates of previous outbreaks are provided in this section, as are magnitude and impact of these outbreaks for those species known to cause economic or visible damage.

Similar species

Although most conifer defoliators are distinctive and readily distinguished, some species closely resemble each other. This section notes morphological characters, host, distribution and bionomic differences that can be used to distinguish similar species.

Defoliator morphology

Description of larvae and the distinguishing characters that enable them to be accurately identified requires the use to some degree of specialized terminology. This section illustrates and defines some of the entomological terms that appear in the species accounts. A glossary is also provided (p. 339).

The body of a caterpillar (Figure 1) or sawfly larva is made up of a head, 3 thoracic segments and 10 abdominal segments.

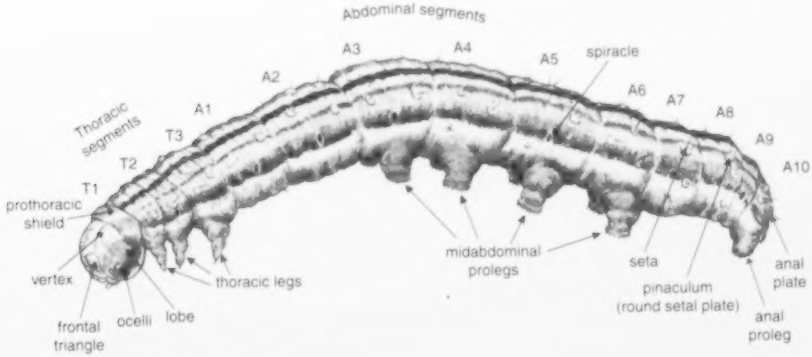

Abdominal segments
A3
A4
A5
spiracle
A2
A1
A6
A7
A8
A9
A10
Thoracic segments
T3
T2
T1
prothoracic shield
vertex
thoracic legs
midabdominal prolegs
seta
anal plate
pinaculum (round setal plate)
anal proleg
frontal triangle
ocelli
lobe

Figure 1. Dorso-lateral view of Lepidoptera larva

The head is enclosed in a tough sclerotized capsule with 6 ocelli on each side or lobe (1 ocellus on each side in a sawfly larva), a frontal triangle, or frons, in the centre of the face, a clypeus, and a labrum beneath the clypeus.

Each of the 3 thoracic segments bears a pair of segmented thoracic legs that terminate in simple claws. The first thoracic segment is covered dorsally with a prothoracic shield (caterpillars only) and bears a pair of lateral spiracles.

The abdomen of a caterpillar has 2, 3, or 5 pairs of fleshy false legs known as prolegs. A sawfly larva has 0, 7, or 8 pairs of prolegs. The prolegs of Lepidoptera bear circles or bands of small hooks called crochets (crochets do not occur on sawfly prolegs), which enable the larva to firmly grip host plants. Eight pairs of lateral spiracles line the abdomen.

Colored lines that run the length of the body are known as stripes; colored lines that encircle the body are called bands. The location of stripes can be described as middorsal, addorsal, subdorsal, supraspiracular, spiracular, subspiracular, adventral, or midventral (Figure 2).

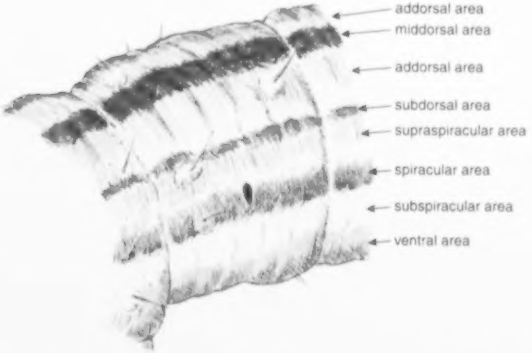

addorsal area
middorsal area
addorsal area
subdorsal area
supraspiracular area
spiracular area
subspiracular area
ventral area

Figure 2. Dorso-lateral view of an abdominal segment

The integument, or skin of the larva, bears setae, which may range from inconspicuous to dense and hairy. Densely hairy caterpillars may have hairs evenly distributed or arranged in tufts, sometimes arising from distinctly colored tubercles or verrucae. In some species, the setal bases, or pinacula, are pigmented lighter or darker than the surrounding integument. The dorsum of the last abdominal segment bears a sclerotized anal plate.

In many species, significant changes in color pattern occur as the larvae develop from early or mid-instar larvae to late-instar larvae.

Defoliator bionomics

The life histories and habits of conifer defoliators vary greatly. The species described here consume conifer foliage by either feeding openly on the foliage or by feeding within the needles—mining out the chlorophyllous tissue between the upper and lower epidermis. Some species initially feed as needleminers, then, as they mature, feed openly on the foliage. A few species are needle tiers: they tie several needles together into sheaths, within which the larvae then shelter and feed. Other species construct solitary or communal feeding nests of frass and mined, skeletonized, chewed-off, or intact needles tied together with webbing. Although most species are solitary feeders, a few feed colonially.

The life cycle of a conifer defoliator includes four stages: egg, larva, pupa, and adult. Eggs may be laid singly, in small groups, or in large masses on host foliage. Some species (*Neodiprion* spp.) insert their eggs into host foliage. Defoliator eggs either hatch within 2 weeks of being laid, or overwinter and hatch up to 9 months later.

Larvae grow rapidly after hatching (except *Choristoneura* spp., which do not feed prior to overwintering as second-instar larvae), and must molt (a process called ecdysis) several times to accommodate growth. The larval stages between each molt are called instars. Although a defoliator larva may complete as few as four or as many as seven instars, most species undergo five instars. The larval stage lasts for 8 to 10 weeks, except in species that overwinter as larvae—when this stage may last as long as 10 months.

Prior to pupation, the mature larva of some species spins a silken cocoon, which may incorporate body hairs, needles, frass, soil and other debris.

Immediately preceding pupation, the prepupal final-instar larva loses much of its distinctive coloration and patterning, and becomes shorter and heavy bodied. The pupal stage lasts about 2 weeks, except in species that overwinter as pupae, when it may last 9 to 10 months. Pupation occurs either soon after the prepupal stage is reached (Lepidoptera), or may not occur until several months later, as with some sawfly species.

A lepidopteran pupa is usually brown and tapers strongly toward the abdominal end (obtect). A sawfly pupa looks like a pale, mummified adult (exarate).

Upon emergence from the pupal case, adults crawl to the surface of the soil or out onto a branch. There, they pump up their wings with blood in preparation for flight. Female moths emit a pheromone to attract mates. Males detect these pheromones with special cells on the antennae, which are often plumose. Once mated, the female flies in search of suitable host plants on which to lay eggs. Female moths of some species have no functional wings; they mate and lay eggs on or near the cocoon from which they emerged.

Many species (63) overwinter in the larval stage. Almost as many species (62) overwinter in the pupal or prepupal stage—often encased in a silken cocoon, and usually buried in the duff. A significant number (32) overwinter in the egg stage. Only a few species (6) overwinter in the adult stage.

Almost all species are univoltine—completing one generation in a year. *Choristoneura biennis* and *Coleotechnites starki* require 2 years to complete their life cycles.

Defoliator damage

The extent to which a tree may be injured by insect defoliation varies. Factors affecting the level of damage include: the severity, frequency and duration of defoliations, the overall health and stored reserve balance of the host trees, the innate ability of each tree species to refoliate after severe defoliation, and the presence of other stressors such as drought, defoliation may result in tree mortality, or in crown or branch dieback and growth loss.

Immediate effects of defoliation are loss of photosynthetic area, reduction of photosynthate production, disruption of fluid and nutrient transport, a decrease in stored reserves, and reduction in growth rate. Defoliated trees are often weakened, which leaves them vulnerable to attack by secondary insects and pathogens.

Complete defoliation is seldom lethal to hardwoods, and they usually recover rapidly by putting out a new flush of foliage to replace that lost. Conifers, on the other hand, do not recover easily from repeated severe defoliation, and often struggle to replace lost foliage. Some conifer defoliators, such as Douglas-fir tussock moth and western hemlock looper, feed on both current and older foliage. The impact of this kind of defoliation on individual trees is often serious and may kill the tree. Other defoliators feed only on new flush (western spruce budworm) or on older foliage (pine sawflies). Unless an infestation lasts for several years, this kind of defoliation has a less serious impact on individual trees.

Fortunately, only a few of the conifer defoliators (~20 spp.) that occur in British Columbia forests are known to periodically go into outbreak and cause economically significant or highly visible damage. Historical information on such outbreaks is provided in the species treatments.

Economically important forest defoliators of British Columbia

Common name	Scientific name
Two-year cycle budworm	*Choristoneura biennis* (Freeman)
Spruce budworm	*Choristoneura fumiferana* (Clemens)
Western spruce budworm	*Choristoneura occidentalis* Freeman
Western blackheaded budworm	*Acleris gloverana* (Walsingham)
Larch bud moth	*Zeiraphera improbana* (Walker)
Western hemlock looper	*Lambdina fiscellaria lugubrosa* (Hulst)
Western false hemlock looper	*Nepytia freemani* (Munroe)
Phantom hemlock looper	*Nepytia phantasmaria* (Strecker)
Saddleback looper	*Ectropis crepuscularia* (Denis and Schiffermüller)
Grey forest looper	*Caripeta divisasta* Walker
Greenstriped forest looper	*Melanolophia imitata* (Walker)
Filament bearer	*Nematocampa resistaria* (Herrich-Schaffer)
Larch looper	*Macaria sexmaculata* (Packard)
Douglas-fir tussock moth	*Orgyia pseudotsugata* (McDunnough)
Rusty tussock moth	*Orgyia antiqua* (Linnaeus)
Larch casebearer	*Coleophora laricella* (Hübner)
Pine white	*Neophasia menapia* (C & R Felder)
Pine needle sheathminer	*Zelleria haimbachi* Busck
a lodgepole pine sawfly	*Neodiprion nanulus contortae* Ross
Hemlock sawfly	*Neodiprion tsugae* Middleton
Larch sawfly	*Pristiphora erichsonii* (Hartig)

Handling specimens

Collecting

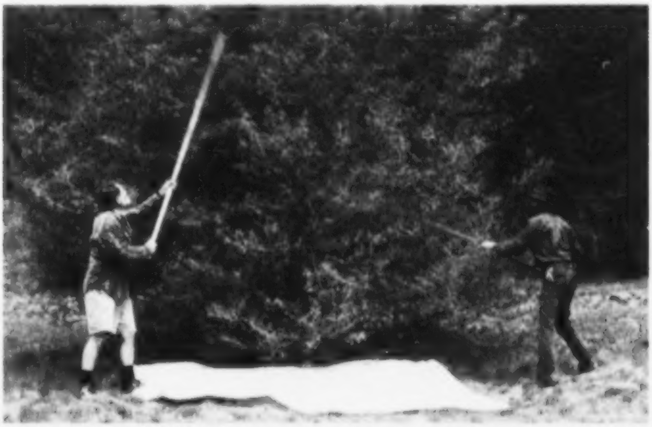
Most of the forest defoliators described in this guide were collected using the beating method. This method is an efficient way to collect most forest defoliators and determine their relative abundance in a forest stand. Trees selected for beating were located in well-lit locations along the margins of forest openings, along road or power-line right of ways, or in open, park-like settings. Most were trees with low, sweeping branches, as they have the largest amount of foliage within easy reach. A large, light-colored drop cloth was spread on the ground beneath the branches, and a stiff 2.5-m to 3-m pole was used to beat the branches to dislodge larvae.

After over-hanging branches were beaten, the drop cloth was examined for larvae—a task made more difficult if large amounts of debris had also fallen on the sheet or if the larvae were small, remained motionless, or exhibited cryptic coloration. After initial examination, the drop cloth was tilted so that the debris slid to one side, revealing additional larvae clinging to the cloth.

Larvae were collected, placed in small containers with host foliage, and held in a cooler at 3°C to 5°C to halt development until photographs could be taken.

Species that mine foliage or feed in conspicuous nests were collected by searching host foliage for characteristic damage or nests. Carefully cutting away the surface of a mined needle or scale leaf would usually reveal the larva within.

Some rare species not readily dislodged from trees were more easily obtained by light trapping gravid females, holding them in a container with suitable foliage until they laid eggs, and then rearing larvae that emerged from the eggs.



Beating tree for defoliator larvae

Rearing defoliators for identification

Images and descriptions presented in this guide will facilitate accurate identification of almost all conifer defoliator larvae found in British Columbia's forests. In some cases, however, a larva may be collected in an early instar that lacks clear characters and can be identified only if the larva is reared to a later instar. In other cases, a specimen may belong to a species with morphologically identical sister species (e.g., *Choristoneura* spp., or *Zeiraphera* spp.). Rearing such larvae to the adult stage may be necessary to verify identification, especially if the host and distribution data of the similar species overlap.

If you rear a forest defoliator larva, follow these recommendations to help ensure success:

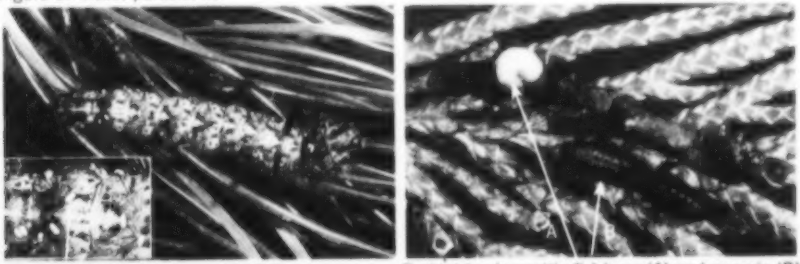
- Maintain a supply of fresh foliage in the rearing container;
- Remove dried or decayed foliage and moulded frass;
- Maintain adequate blotting material so that moisture does not condense on the container walls, and;
- Rear larvae singly to reduce spread of disease and ensure isolation of single species.

Suitable rearing containers include vials, plastic bags, sleeved branches, or caged potted plants.

For species overwintering as pupae, prepupae or larvae, a suitable substrate such as sphagnum peat moss helps maintain moisture and suppress fungal growth. Overwintering strategies include maintaining specimens in an unheated shed or in a refrigerator at 2°C to 4°C.

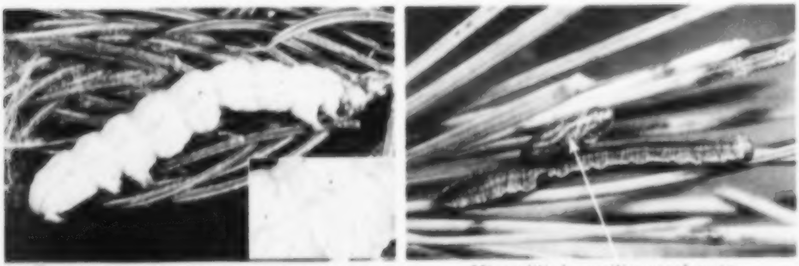
Field-collected larvae that are being reared are subject to a number of mortality factors, including fly and wasp parasitoids (Figure 3) and several entomopathogens such as viruses, bacteria and fungi. Bacterial and viral entomopathogens have been used successfully to control damaging outbreaks of some forest defoliators.

Figure 3. Insect parasitoids



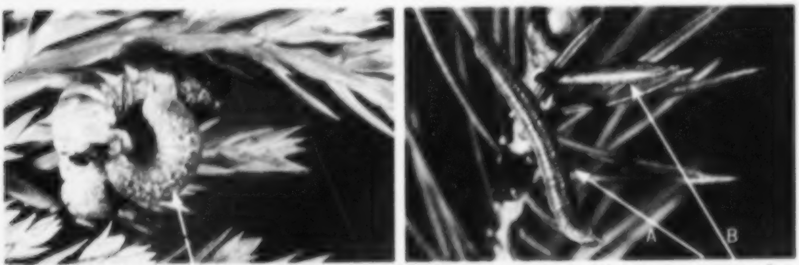
Tachinidae (parasitic fly) eggs on *Panthea virginarius* larva

Tachinidae (parasitic fly) larva (A) and puparia (B) emerging from *Neoalcis californiaria* larva



Copidosoma (parasitic wasp) pupae in *Syngrapha alias* larva

Microplitis (parasitic wasp) pupa on *Eupithecia lariciata* larva



Braconid (parasitic wasp) larva feeding on *Digrammia triviata* larva

Rogas (parasitic wasp) pupa in remains of *Eupithecia longipalpata* larval integument (A) unparasitized larva and (B) parasitized larva

Photography

Most of the defoliator species described in this guide have unique coloration and morphology, making it possible to accurately identify these species from high-quality color images—especially if host, geographic location and collection date are also known. High-quality photographic images are key to capturing these unique characters.

All photographs in this guide were taken by either the author or Dion Manastyrski, with the following exceptions: *Syngrapha viridisigma* (p. 226), by Northern Forestry Centre, Canadian Forest Service, and *Eupithecia interruptofasciata*, green-color form (p. 90), by Klaus Bolte, Canadian Forest Service, Ottawa.

All photographs by Duncan or Manastyrski were taken in a laboratory setting, using a stand-mounted 35-mm, single-lens reflex camera with a 90-mm macro lens. A 52.5-mm extension tube was also used when photographing smaller species or early instars. ASA 50 slide film was used to ensure high quality.

Larvae were photographed either crawling, resting or feeding on host foliage. A second spray of host foliage was placed beneath the subject to provide a natural-appearing background. The larva and the second foliar spray were independently illuminated with a pair of slave-triggered flash units.

Images showing lateral, dorso-lateral and dorsal views were taken for most species. For polymorphic species, a series of photographs document the ranges of color pattern forms. Mid- and final-instar larvae of species in which these stages differ dramatically were photographed, as was typical feeding damage for species that cause distinctive damage.

Photographic key to the conifer defoliators of British Columbia

Insects that consume conifer foliage in British Columbia are almost exclusively larvae of either moths and butterflies (Lepidoptera) or sawflies (Hymenoptera: suborder Symphyta). There are approximately 185 species of these conifer-defoliating larvae known to occur in the province. By using the photographic key provided, you will be able to identify almost any defoliator larva found feeding on a coniferous host in British Columbia. The images are organized in photo galleries representing order, family and species groups.

By selecting the image in each photo gallery that most closely resembles your specimen, you will progressively narrow your search to more closely related groups (order, family, species), until a species-level identification can be made.

How to identify a conifer defoliator larva

First, determine if the unidentified larva is a defoliator or one of several kinds of non-defoliator larvae—such as lady beetle larvae, syrphid larvae, lacewing larvae, or algae-eating caterpillars—frequently found associated with defoliator larvae on conifer foliage (p. 17). If the specimen appears to be a defoliator larva, determine the **order** in which it belongs by comparing and selecting the image most similar to your specimen from the photo gallery of larvae typical of each order (p. 18–19).

Similarly, determine the **family** in which your specimen belongs by comparing and selecting the image most similar to your specimen from the photo gallery of larvae representative of each family (Lepidoptera: p. 20–21; Symphyta: p. 36). Brief notes (number of species in family, size of mature larva, unusual or distinctive morphological features or habits, distribution and hosts) below each photograph simplify identification.

Finally, determine **species** by comparing and selecting the most similar larva in the photo gallery that shows all species in the family you have selected. The following steps should simplify species identification using the images beginning on pages 22 and 37:

1. Compare your specimen to species photographs in the selected family to find the best overall morphological match.
2. If your specimen matches a morphologically unique and distinctive species, go to the species treatment to confirm your identification (page number is indicated below image).
3. If your specimen falls within a group of morphologically similar species, determine which of these species have host and distribution data that matches those of your specimen. If only one species provides a morphological, host and distribution match, go to that species treatment to confirm your identification (page number is indicated below image).

4. If your specimen falls within a group of morphologically similar species, and the hosts and distribution of two or more of the species match those of your specimen, use additional morphological characters listed under the photograph to complete the identification.

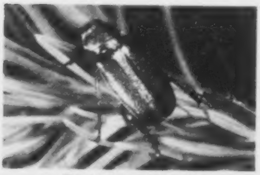
5. In rare cases in which two or more species are morphologically identical and have overlapping hosts and distribution, it may be necessary to rear the larva to the adult stage (as indicated in the image caption) to complete the identification. If an adult Noctuidae or Geometridae has been reared, refer to the images and references provided by the Canadian Biodiversity Information Facility's *Moths of Canada* website to complete or verify identification.

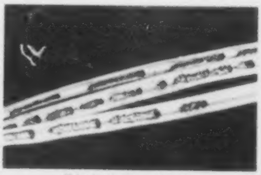
You may also refer to the key diagnostic characters provided in the order and family descriptions, as well as in the Similar Species section of each species treatment. Alternatively, you may opt to search by host or species (index p. 353).

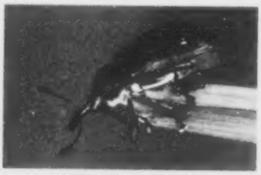
Note: This photographic key is based on images of penultimate- or final-instar larvae that exhibit typical color patterns. Occasionally, a larva exhibiting a less common color pattern may be collected that doesn't closely match the species images provided in the key. Also, mid- or early instar larvae of some species have color patterns very different than those of the species' mature larva. Photographs of larvae with these less common color pattern forms, as well as of mid-instar larvae that have color patterns very different from those of the mature larvae, are provided in the individual species treatments, beginning on p. 39.

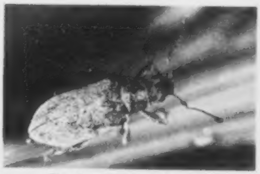
Non-larval defoliators

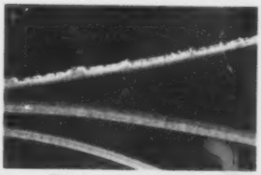
You may occasionally encounter non-larval (adult) defoliators or their damage while examining conifer foliage. Although this guide is about larval defoliators, the following images illustrate some of the more common non-larval conifer defoliators found in British Columbia. This group is not otherwise described in this guide.

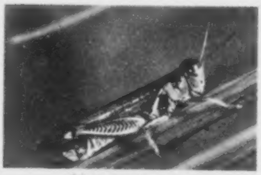

Dichelonyx backi
A defoliating scarab beetle


Dichelonyx backi
Damage on ponderosa pine


Magdalis lecontei
A defoliating weevil


Pachyrhinus elegans
A pine needle weevil

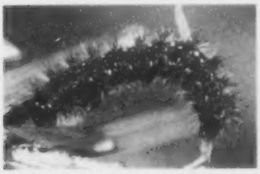

Pachyrhinus elegans
Damage on ponderosa pine


Melanoplus sp.
A defoliating grasshopper

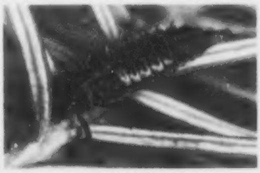
Begin search here:

▶ Non-defoliator larvae

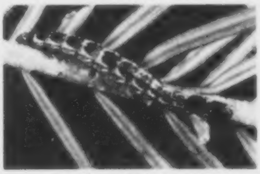
Use the images below to rule out some of the more common non-defoliator larvae found on conifer foliage.



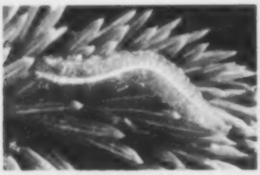
Eilema bicolor Arctiidae
algae-eating caterpillar
(only non-defoliator caterpillar commonly found on conifers)



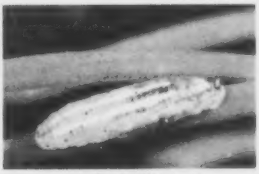
Coccinellidae
lady beetles
(predators)



Neuroptera
lacewings and snakeflies
(predators)



Syrphidae
syrphid flies
(predators)



Syrphidae
syrphid flies
(predators)

If your larval specimen does not appear similar to any of the above non-defoliator larvae, continue your search by determining which order your specimen belongs in.

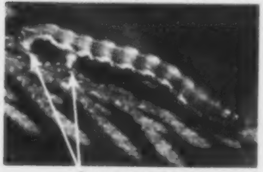
▶ Identification of order

The following images illustrate some of the variation in larvae found within the order Lepidoptera (moths and butterflies) and the order Hymenoptera, suborder Symphyta (sawflies). Some of the more obvious distinctive characteristics separating these two orders include: Lepidoptera larvae have 2, 3 or 5 pairs of abdominal prolegs bearing crochets, and 4 or more ocelli on each side of the head capsule; Symphyta larvae have 0, 7 or 8 pairs of abdominal prolegs without crochets, and a single large ocellus on each side of the head capsule.

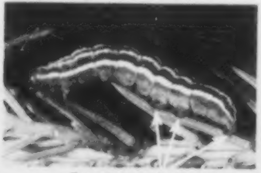
Order Lepidoptera (Moths and Butterflies)

Diagnostic characters:

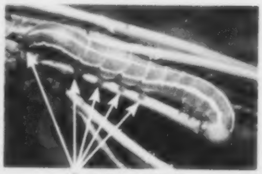
1. 2, 3 or 5 pairs of abdominal prolegs with crochets



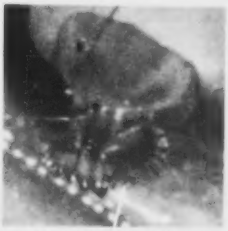
2 pairs prolegs



3 pairs prolegs

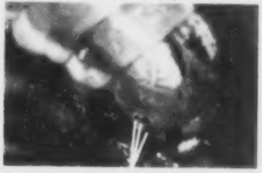


5 pairs prolegs



crochets on proleg

2. 4 or more ocelli on each side of the head capsule



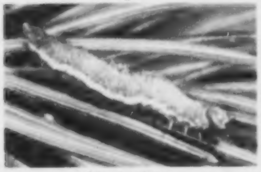
ocelli

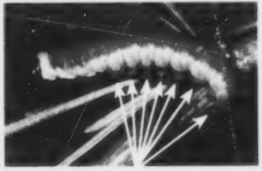
If your larva broadly resembles any of these images and possesses these diagnostic characters, continue your search in the Lepidoptera families section beginning on page 20.

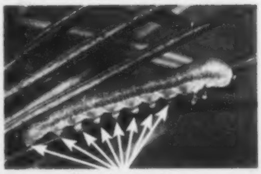
Order Hymenoptera: Suborder Symphyta (Sawflies)

Diagnostic characters:

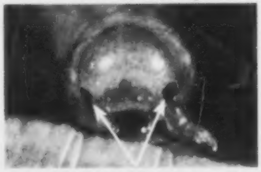
1. 0, 7 or 8 pairs of abdominal prolegs without crochets


No prolegs


7 pairs prolegs


8 pairs prolegs

2. single large ocellus on each side of the head capsule


single large ocellus on
each side of head

If your larva broadly resembles any of these images and possesses these diagnostic characters, continue your search in the Symphyta family section beginning on page 36.

▶ Identification of family

Although size, shape and color often varies widely within a family, you will be able to make some generalizations in selecting the correct family or narrowing your search to two or three families when you compare your specimen to the larvae in the following photo galleries. The brief notes (number of species in family, size of mature larva, unusual or distinctive morphological features or habits, distribution, and hosts) below each image will aid selection of the correct family.

After identifying the image most similar to your specimen, go to the photo gallery for the family you have selected (page number indicated under image) and find the species that most closely resembles your specimen.

For cases in which family identification may not be clear, additional distinguishing characters are provided in the family descriptions immediately following this section.

Key to geographic and host descriptors used in captions

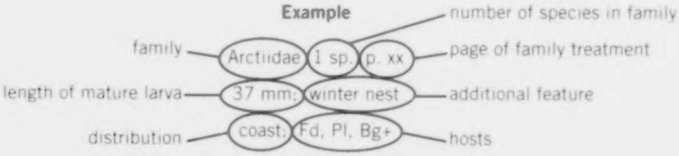
Geographic:

BC- entire province, **n**- north (56° to 60°), **s**- south (49° to 52°), **c**- central (52° to 56°), **e**- east, **w**- west, **VI**- Vancouver Island, **QCI**- Queen Charlotte Islands

Host:

Many- numerous species, **Ba**- amabilis fir, **Bg**- grand fir, **Bl**- subalpine fir, **Cw**- western redcedar, **Co**- ornamental cedar/cypress, **Cy**- yellow-cedar, **Fd**- Douglas-fir, **Hm**- mountain hemlock, **Hw**- western hemlock, **Jr**- Rocky Mountain juniper, **Jc**- common juniper, **Jo**- ornamental juniper, **La**- subalpine larch, **Lo**- ornamental larch, **Lt**- tamarack, **Lw**- western larch, **Pa**- whitebark pine, **Pj**- jack pine, **Pl**- lodgepole pine, **Pf**- limber pine, **Po**- ornamental pine, **Pw**- western white pine, **Py**- ponderosa pine, **Sb**- black spruce, **Se**- Engelmann spruce, **So**- ornamental spruce, **Ss**- Sitka spruce, **Sw**- white spruce, **Tw**- western yew

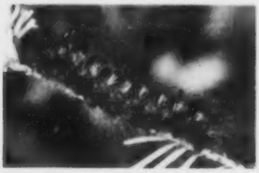
Note: the + character after host list indicates additional unlisted hosts which can be found in the Hosts section of each species treatment.

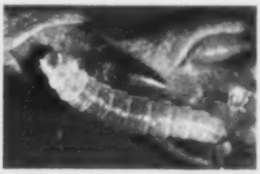

Example
number of species in family
family
Arctiidae
1 sp.
p. xx
page of family treatment
length of mature larva
37 mm;
winter nest
additional feature
distribution
coast;
Fd, Pl, Bg+
hosts

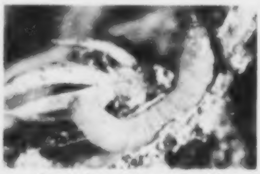
Lepidoptera MOTHS AND BUTTERFLIES

The conifer-feeding Lepidoptera of British Columbia include more than 160 species from 16 families. These families are listed in alphabetic order.

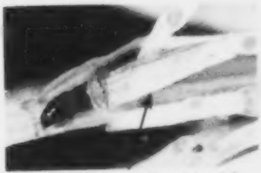
Lepidoptera Families: quick lookup photo gallery (16 families)

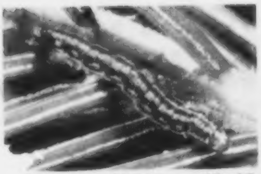

Arctiidae 1 sp. p. 40
37 mm; winter nest
coast; Fd, Pl, Bg+

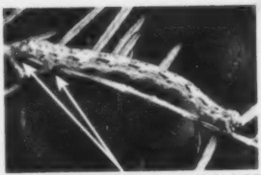

Argyresthiidae 1 sp. p. 42
6 mm; mines foliage
coast; Co, Jo

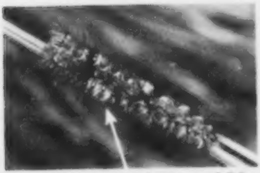

Cochylidae 1 sp. p. 44
6 mm; webbed nests
s interior; Jc

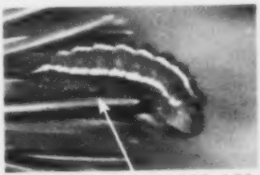
Lepidoptera - Photographic key

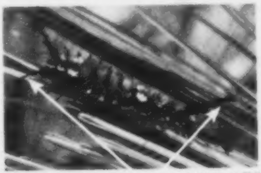

Coleophoridae 1 sp. p. 46
6 mm; casebearer
s interior; Lw

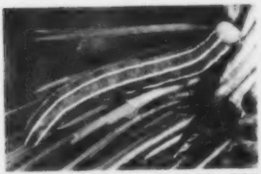

Gelechiidae 10 spp. p. 48–65
6 to 14 mm; miners, tiers, nests
BC; many hosts

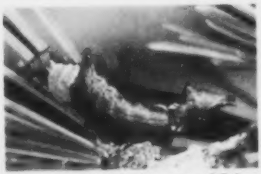

Geometridae 61 spp. p. 66–165
18 to 50 mm; 2 pairs prolegs
BC; many hosts

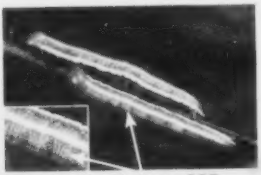

Lasiocampidae 1 sp. p. 166
34 mm; long basal hairs
s BC; Fd, Pl, Py, Se

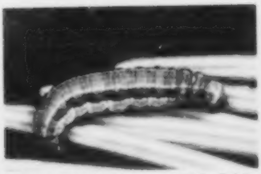

Lycaenidae 3 sp. p. 168–173
15 mm; fine downy hair
BC; Pl, Jr, Cw

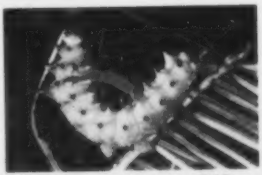

Lymantriidae 3 spp. p. 174–179
30 to 35 mm; pencil tufts
BC; Fd, Hw, Se, Py, Pl+

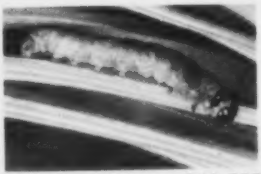

Noctuidae 32 spp. p. 180–233
25 to 50 mm; heavy bodied
BC; many hosts

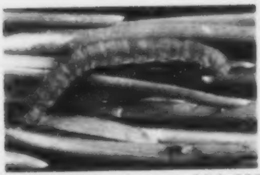

Notodontidae 1 sp. p. 234
34 mm; dorsal protuberances
s BC; Lw


Pieridae 1 sp. p. 235
25 mm; abdominal annuli
s BC; Py, Pl


Pyralidae 4 spp. p. 236–241
15 to 20 mm
BC; Fd, Se, Sw, Bg


Saturnidae 1 sp. p. 242
90 mm; spines
s BC; Fd, Bg


Tortricidae 31 spp. p. 244–303
7 to 25 mm
BC; many hosts


Yponomeutidae 2 spp. p. 304–307
7 to 14 mm; miners,
needle tiers
BC; Pl, Py, Pw

Family descriptions and species of Lepidoptera (by family): quick lookup photo galleries

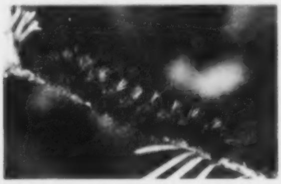
Lepidoptera MOTHS AND BUTTERFLIES

Each family is briefly described in alphabetic order. A photo gallery of all or nearly all of the family's species known to occur in British Columbia follows each description.

Select the photograph that most closely resembles your specimen and proceed to the species description to confirm your identification. When several similar species with overlapping hosts and distributions occur within a family, use the distinguishing characters provided under each photograph, as well as under the Similar Species heading within the species descriptions, to complete the identification. See also detailed species identification instructions on p. 15.

Note: family descriptions are based on variation found in species occurring on conifers in British Columbia.

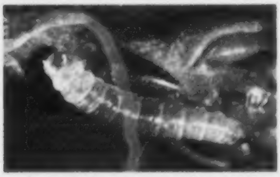
Family Arctiidae (1 species) TIGER MOTHS



Lophocampa argentata p. 40
37 mm; coast; Fd, Pl, Bg

Mature larvae are medium to large, 35 mm to 40 mm long. The body is densely covered with tufts of long setae borne on well-developed verrucae. Larvae overwinter in silken webs and are present from August to June. Arctiid larvae appear somewhat similar to conifer-feeding lasiocampiids, lymantriids and some noctuids (*Panthea* spp.). The single conifer-feeding arctiid species occurring in British Columbia is easily distinguished from other hairy caterpillars by its distinct color and arrangement of body hairs.

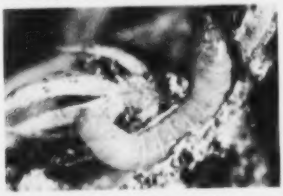
Family Argyresthiidae (1 species) NEEDLEMINER MOTHS



Argyresthia cupressella p. 42
6 mm; coast; Co, Jo

Mature larvae are small, 6 mm long, and unmarked yellowish green. Larvae tunnel in scale leaves and shoot tips of cypress, juniper and cedar in south coastal British Columbia. Argyresthiids overwinter as larvae in scale leaves, and are present from July to May.

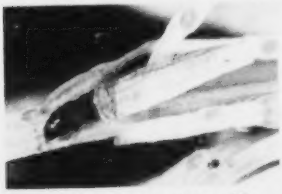
Family Cochylidae (1 species) COCHYLIID MOTHS



Aethes rutilana p. 44
6 mm; s interior; Jc

Mature larvae are small, 6 mm long, and unmarked creamy yellow. Larvae mine common juniper needles, and construct frass-covered, silk-lined tubes within larger feeding nests. Cochylids overwinter as larvae in silk tubes, and are present from July to May. The larva of this species is easily distinguished from the larva of *Dichomeris marginella* (p. 64), the only other species that causes similar damage on common juniper.

Family Coleophoridae (1 species) CASEBEARER MOTHS

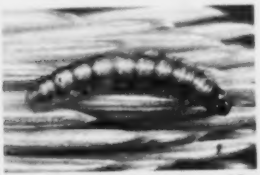


Coleophora laricella p. 46
6 mm; s interior; Lw-index

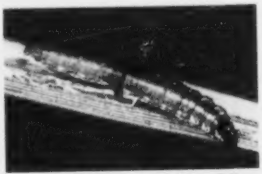
Mature larvae are small, 6 mm long. The purplish brown larva is mostly concealed within a portable case (hollowed larch needle). Larvae overwinter in cases attached to twigs, usually near the base of buds. Larvae are present from late July to early June. The case-bearing habit distinguishes this species from other conifer-feeding larvae in British Columbia.

Family Gelechiidae (10 species) GELECHIID MOTHS

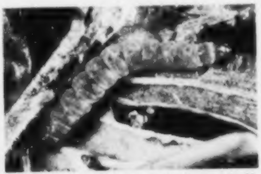
Mature larvae are small, 6 mm to 14 mm long. Most species mine needles or web needles together into feeding shelters. Although they appear somewhat similar to tortricids and pyralids, gelechiid larvae are, on average, much smaller and cause distinct feeding damage.



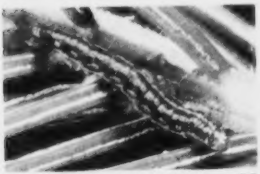
Chionodes continuella p. 48
12 mm; interior; Se, Sw



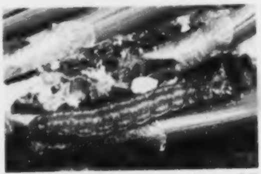
Chionodes retiniella p. 50
14 mm; s interior; Py



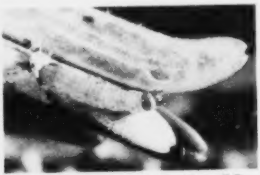
Coleotechnites apicitripunctella p. 54
7 mm; coast; Hw



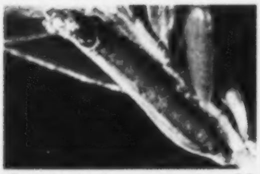
Coleotechnites atrupictella p. 56
12 mm; BC; Se, Sw, Fd

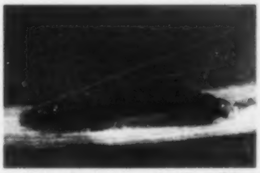


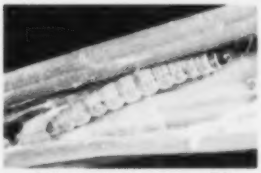
Coleotechnites canusella p. 57
9 mm; s interior; Pl

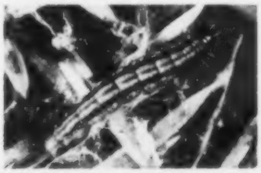


Coleotechnites granti p. 58
6 mm; se interior; Bg

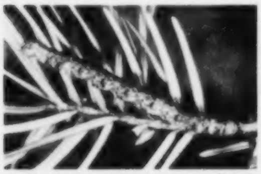

Coleotechnites macleodi p. 60
7 mm; coast; Hw

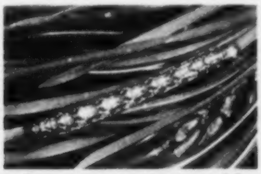

Coleotechnites starki p. 62
6 mm; se interior; Pl

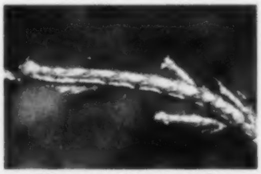

Coleotechnites sp. p. 52
7 mm; s coast; Fd

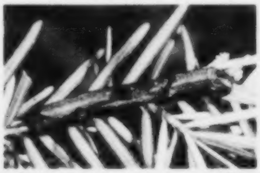

Dichomeris marginella p. 64
14 mm; s BC; Jc

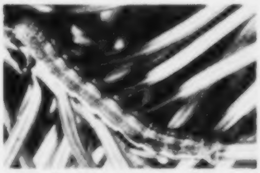
Family Geometridae (61 species) LOOPERS, INCHWORMS and SPANWORMS
Mature larvae are medium to large, 20 mm to 50 mm long. The often slender-bodied larvae have only 2 pairs of abdominal prolegs—one pair on segment 6, and the other at the posterior end of the body. The larvae feed openly on foliage. Most are excellent mimics, closely matching background foliage or twigs.

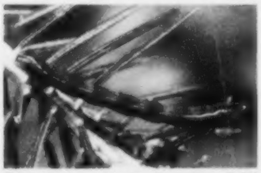

Caripeta aequaliaria p. 66
42 mm; s BC; Py, Pl, Fd

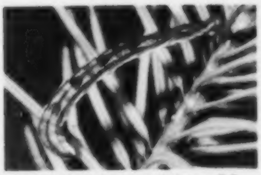

Caripeta angustiorata p. 68
34 mm; s, c interior; Pl


Caripeta divisata p. 70
35 mm; s, c BC; Hw, Fd, Se+

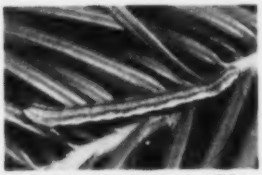

Ectropis crepuscularia p. 76
35 mm; s, c BC; Hw+


Enypia venata p. 80
32 mm; s, c BC; Hw, Fd+

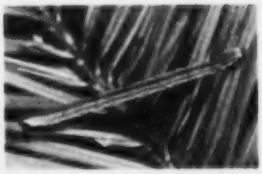

Thallophaga hyperborea p. 163
23 mm; s, c BC; Hw, Ss, Se, Fd



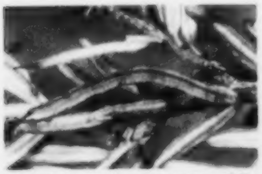
Eupithecia annulata p. 86
22 mm; BC; Se, Fd+



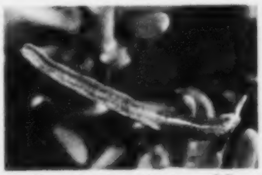
Eupithecia olivacea p. 96
20 mm; s BC; Fd



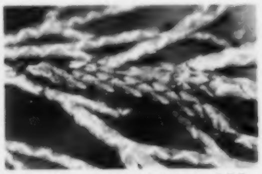
Eupithecia lariciata p. 91
22 mm; BC; Fd, Se, Lw



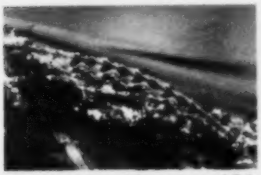
Eupithecia harrisonata p. 88
20 mm; coast; Hw



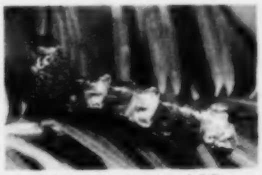
Eupithecia palpata p. 98
20 mm; BC; Fd, Pl+



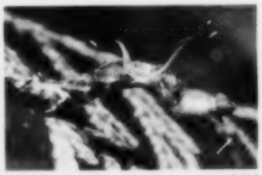
Eupithecia placidata p. 100
20 mm; s, c interior; Jr



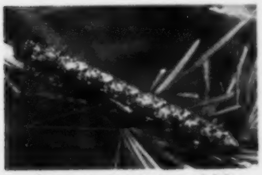
Eupithecia subfuscata p. 104
16 mm; s, c BC; Pl, Ss, Fd+



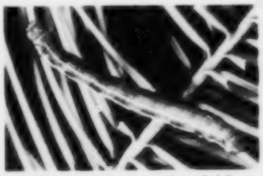
Gabriola dyari p. 107
20 mm; s, c BC; Hw, Fd+



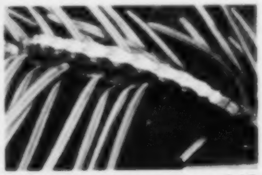
Nematocampa resistaria p. 136
21 mm; BC; Hw, Fd+



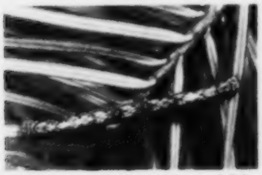
Synaxis pallulata p. 160
32 mm; s, c BC; Fd, Hw+



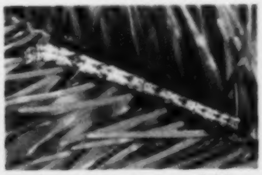
Nepytia freemani p. 140
25 mm; s interior; Fd



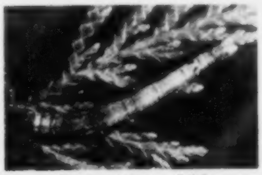
Nepytia u. nigrovenaria p. 143
35 mm; s coast; Fd, Hw



Neoalcis californiaria p. 138
35 mm; coast; Fd, Hw+

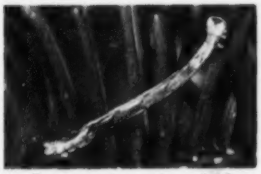


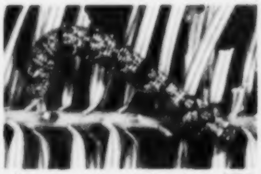
Pero behrensaria p. 144
40 mm; s, c BC; Fd, Se+

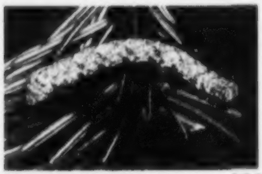


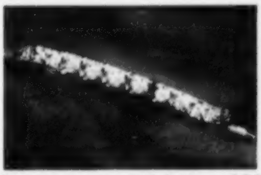
Pero mizon p. 146
50 mm; s BC; Cw, Co

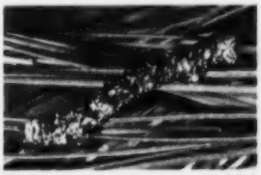
Photographic key - Lepidoptera

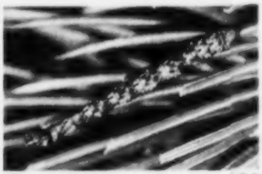

Pero morrisonaria p. 148
32 mm; s, c BC; Fd, Hw

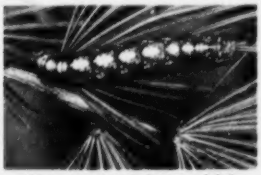

Stenoporpia excelsaria p. 154
37 mm; s BC; Fd
Larva matures in September

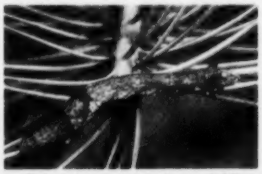

Stenoporpia p. albescens p. 156
37 mm; coast; Fd, Hw+
Larva matures in June

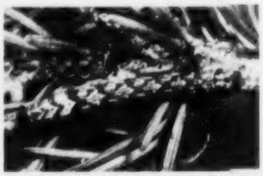

Stenoporpia p. satisfacta p. 158
35 mm; s interior; Fd, Py
Larva matures in June

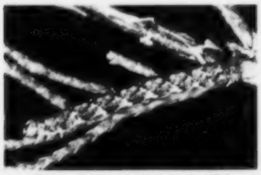

Nacophora mexicanaria p. 134
50 mm; s interior; Py

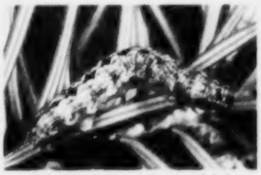

Protoboarmia porcelaria p. 150
25 mm; BC; Fd, Se, Hw+

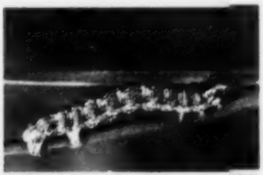

Hypagyrtis piniata p. 116
27 mm; interior; Fd, Hw+

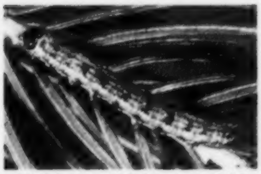

Tetracis cachexiata p. 162
45 mm; s interior; Fd

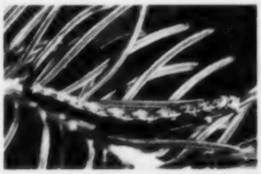

Eulithis destinata p. 85
25 mm; s, c BC; Bl

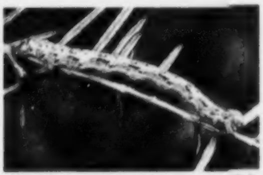

Digrammia triviata p. 74
26 mm; s interior; Jr

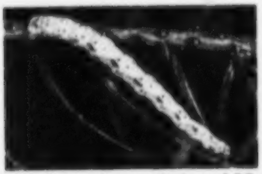

Hydriomena irata p. 114
20 mm; s, c BC; Fd, Hw+


Hydriomena speciosata p. 115
20 mm; coast; Pl, Fd, Hw

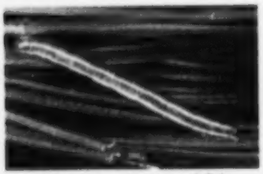

Hydriomena divisaria p. 112
18 mm; s, c interior; Se


Lambdina f. fiscellaria p. 118
30 mm; ne BC; Sw, Bl+

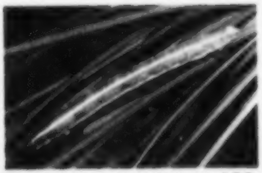

Lambdina f. lugubrosa p. 120
30 mm; s, c BC; Hw, Fd+



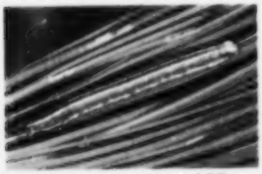
Lambdina f. somniaria p. 122
30 mm; VI; Fd



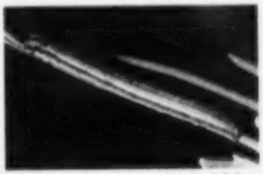
Macaria adonis p. 124
32 mm; s BC; Py, Pl
Larva matures in August



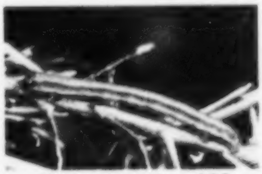
Sabulodes edwardsata p. 152
32 mm; s interior; Py, Pl+
Larva matures in May



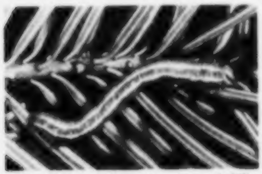
Glena nigricaria p. 108
32 mm; s interior; Py, Pl, Fd



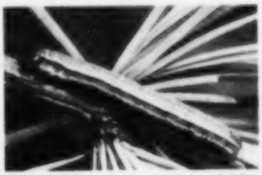
Macaria marmorata p. 126
25 mm; interior; Pl



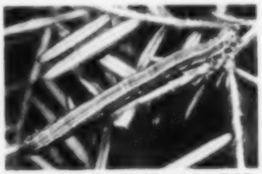
Macaria signaria p. 130
22 mm; s, c BC; Hw, Se+



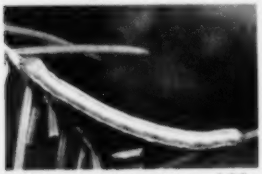
Macaria unipunctaria p. 132
25 mm; s, c interior; Fd



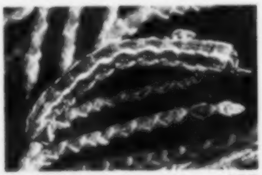
Macaria sexmaculata p. 128
19 mm; interior; Lw, Lt



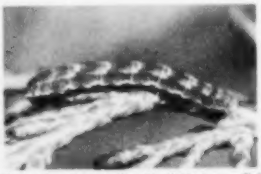
Nepytia phantasmaria p. 142
28 mm; s coast; Hw, Fd



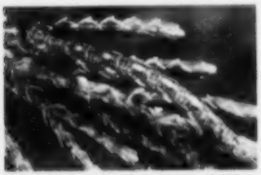
Melanolophia imitata p. 133
37 mm; s, c BC; Fd, Hw+



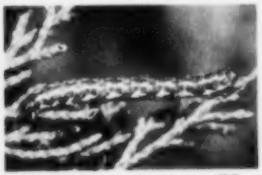
Stamnoctenis morrisata p. 153
24 mm; s, c BC; Jr



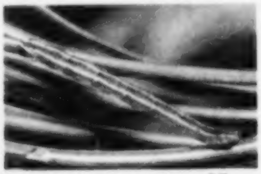
Eupithecia niphadophilata p. 94
20 mm; s, c interior; Jr



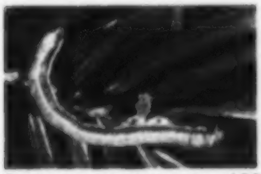
Eupithecia unicolor p. 106
20 mm; coast; Cw, Cy

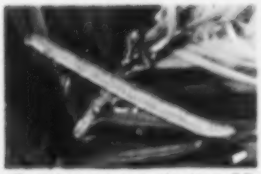


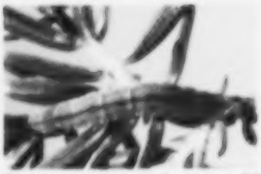
Digrammia setonana p. 73
25 mm; s BC; Jr

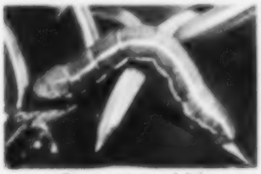


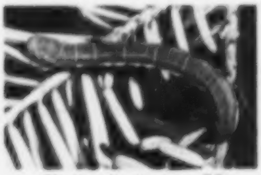
Eupithecia ornata p. 97
20 mm; s, c BC; Pl

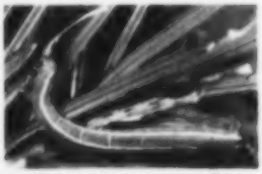

Eupithecia pseudotsugata p. 102
20 mm; s BC; Fd

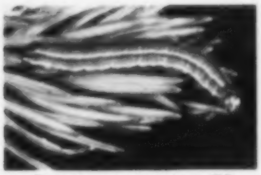

Eupithecia longipalpata p. 92
20 mm; coast; Fd, Hw

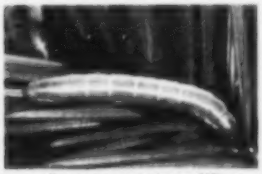

Eupithecia interruptofasciata p. 90
16 mm; interior; Jc

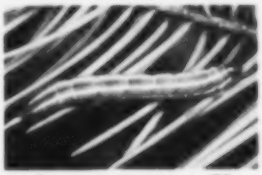

Thera otisi p. 164
16 mm; s interior; Jc

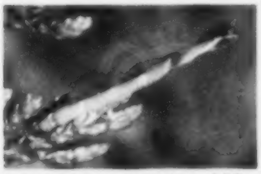

Cladara limitaria p. 72
24 mm; s, c BC; Hw, Fd, Se


Epirrita pulchraria p. 84
21 mm; s, c BC; Hw, Ss+

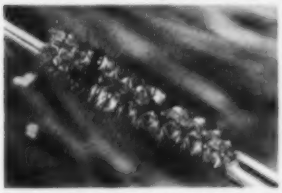

Epirrita autumnata p. 82
25 mm; s, c BC; Hw, Se+


Enypia griseata p. 78
25 mm; s, c interior; Fd, Hw


Enypia packardata p. 79
25 mm; coast; Fd, Hw


Hemithea aestivaria p. 110
27 mm; s coast; Co

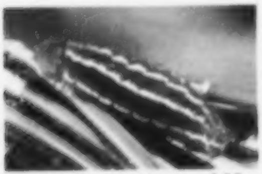
Family Lasiocampidae (1 species) LAPPET MOTHS


Tolype dayi p. 166
34 mm; s BC; Fd, Py, Pl

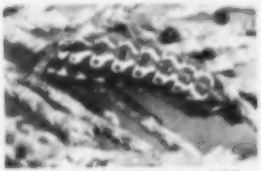
Mature larvae are large, 34 mm long. The body is densely covered with medium to long downy setae that are not borne on verrucae or arranged in compact tufts, tussocks or pencils. Setae are more densely arranged sublaterally. The head is smaller than the prothorax, which bears two pairs of fleshy protuberances above the thoracic legs. This species can readily be distinguished from other hairy caterpillars by its lack of distinct dorsal pencil tufts.

Family Lycaenidae (3 species) HAIRSTREAKS

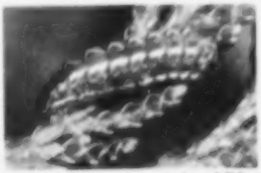
Mature larvae are small, 15 mm long. The body is somewhat stout and tapers at each end. The head is small, retractile and usually concealed from above by the prothorax. The body is covered with short secondary setae, giving the larva a velvety appearance. Cryptic coloration closely mimics host foliage.



Callophrys eryphron p. 168
15 mm; BC; Pl



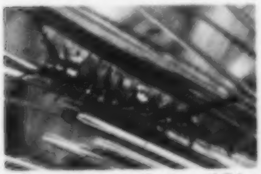
Callophrys g. barryi p. 170
15 mm; s, c BC; Jr



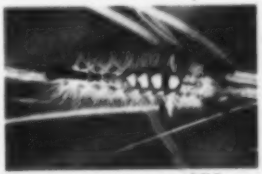
Callophrys g. rosneri p. 172
15 mm; s BC; Cw

Family Lymantriidae (3 species) TUSSOCK MOTHS

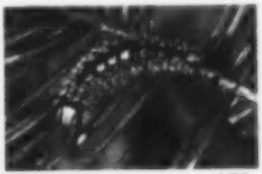
Mature larvae are medium to large, 30 mm to 35 mm long. Thorax and abdomen are attractively adorned with dorsal tufts and pencils of hairs. Plumose secondary setae arise from the verrucae. Middorsal eversible glands, sometimes brightly colored, occur on the sixth and seventh abdominal segments.



Dasychira grisefacta p. 174
35 mm; BC; Fd, Hw, Py+



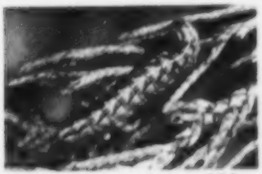
Orgyia antiqua p. 176
30 mm; BC; many



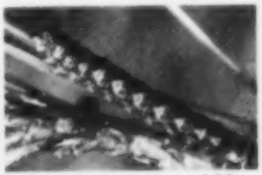
Orgyia pseudotsugata p. 178
30 mm; s BC; Fd

Noctuidae (32 species) CUTWORMS

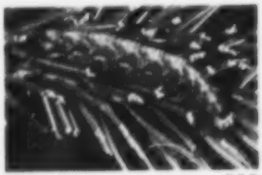
Mature larvae are medium to large, 25 mm to 50 mm long. Most are heavy bodied and smooth, and have inconspicuous primary setae. *Panthea* spp. are an exception, having well-developed secondary setae on verrucae. The genus *Syngrapha* has only 2 pairs of midabdominal prolegs; all other genera have the normal complement of 4 pairs of midabdominal prolegs.



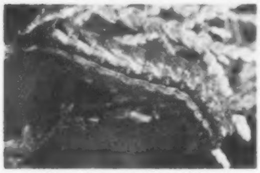
Abagrotis mirabilis p. 180
32 mm; s interior; Jr



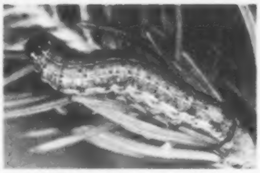
Abagrotis new sp. p. 182
36 mm; s interior; Py



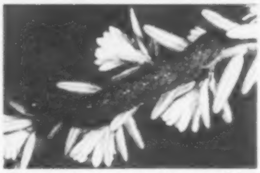
Lithophane innominata p. 202
30 mm; BC; Ss, Se+



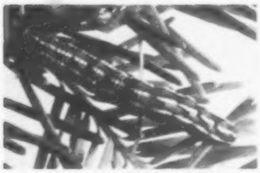
Eurois occulta p. 195
35 mm; BC; Cw, Co



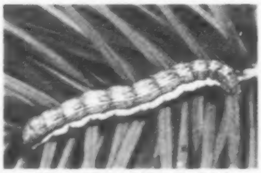
Egira simplex p. 194
30 mm; s BC; Fd, Ss



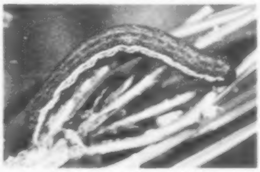
Phlogophora periculosa p. 216
28 mm; s BC; Hw, Fd+



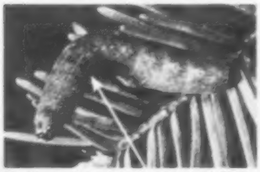
Xestia praevia p. 229
28 mm; interior; Fd, Se



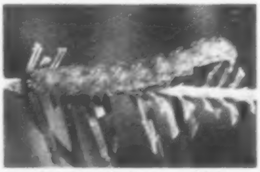
Xestia mustelina p. 227
26 mm; s, c BC; Fd,



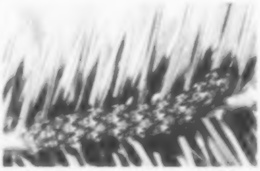
Egira curialis p. 188
38 mm; s BC; Py, Fd, Pl



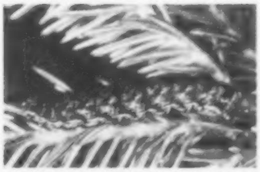
Abagrotis pulchrata p. 184
40 mm; s coast; Fd
Dark saddle on 1st abdominal segment



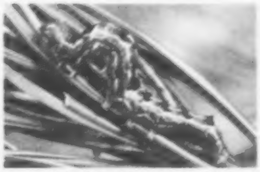
Egira perlubens p. 192
35 mm; s BC; Fd, Hw, Bg



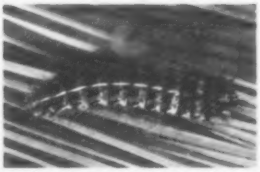
Xestia perquiritata p. 228
28 mm; interior; Se, Sw



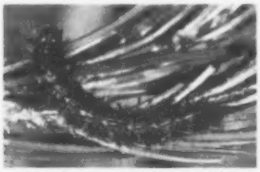
Xylotype arcadia p. 230
33 mm; interior; Se, Sw



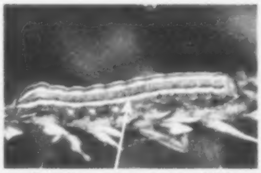
Zale duplicata p. 232
35 mm; BC; Pl



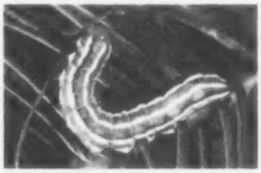
Panthea gigantea p. 212
50 mm; s interior; Py



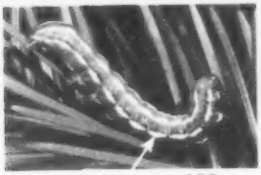
Panthea virginarius p. 214
48 mm; s, c BC; Pl, Fd+



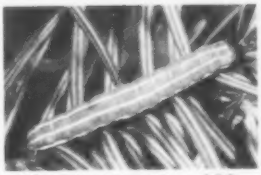
Feralia comstocki p. 196
30 mm; s, c interior; Fd
Spiracular stripe continuous



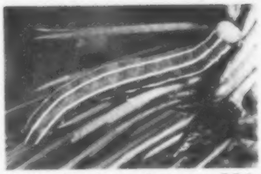
Feralia deceptiva p. 197
35 mm; s coast; Fd



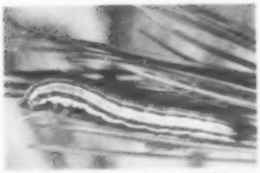
Feralia jocosa p. 198
30 mm; s, c interior; Fd, Hw+
Spiracular stripe broken into
discrete oval segments



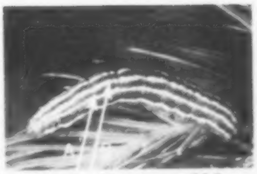
Cosmia praeacuta p. 186
25 mm; s BC; Fd



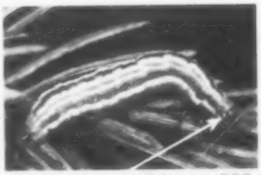
Lithophane ponderosa p. 204
50 mm; s interior; Py, Pl



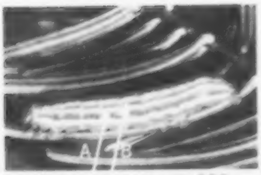
Lithophane atara p. 200
48 mm; s, c Okanagan; Py



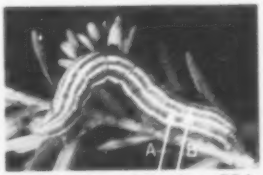
Syngrapha alias p. 218
25 mm; BC; Se, Sw, Ss+
Space between stripes (A) wider
than addorsal stripe (B)



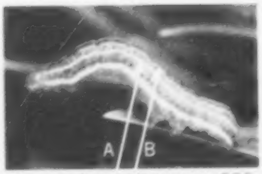
Syngrapha angulidens p. 220
24 mm; s, c interior; Ba, Se
Head capsule spotted



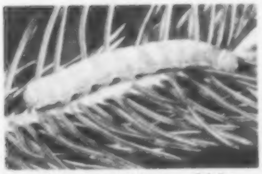
Syngrapha celsa p. 222
24 mm; s, c BC; Bg, Ba, Bl+
Space between stripes (A) much
narrower than addorsal stripe (B)



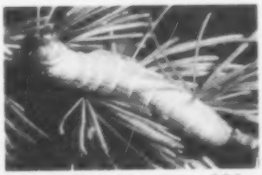
Syngrapha rectangula p. 224
25 mm; s, c BC; Hw+
Space between stripes (A)
subequal to addorsal stripe (B)



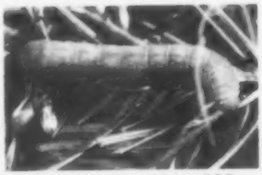
Syngrapha viridisigma p. 226
25 mm; BC; Se, Fd, Bl+
Space between stripes (A) much
wider than addorsal stripe (B)



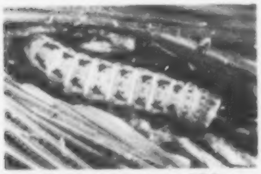
Orthosia hibisci p. 210
30 mm; BC; Se, Sw



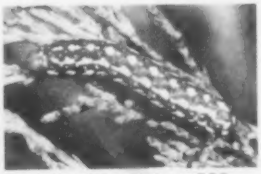
Lithophane thaxteri p. 206
30 mm; BC; Lt, Lw



Lithophane vivida p. 208
32 mm; s, c BC; Fd

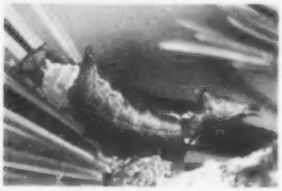


Egira hiemalis p. 190
30 mm; s BC; Fd, Pl



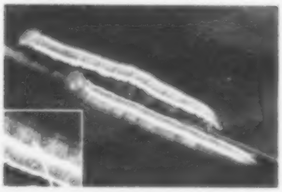
Lithophane itata p. 203
28 mm; s interior; Jr

Family Notodontidae (1 species) PROMINENTS


Schizura unicornis p. 234
34 mm; s BC; Lw

Mature larvae are medium sized, 35 mm long. Prominent and distinctive protuberances on dorsum.

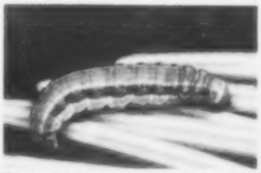
Family Pieridae (1 species) WHITES

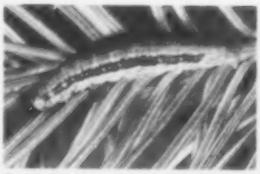

Neophasia menapia p. 235
25 mm; s BC; Py, Pl

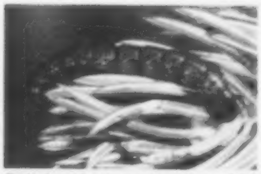
Mature larvae are medium sized, 20 mm long. Several annuli ringing each abdominal segment distinguish this family from other families.

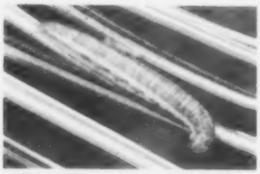
Family Pyralidae (4 species) PYRALID MOTHS

Mature larvae are small to medium sized, 15 mm to 25 mm long. Primary setae only, mostly on strongly pigmented pinacula. Although pyralid larvae appear similar to tortricid larvae, the larvae of the 4 pyralid species in this guide have distinct color patterns unlike those of any tortricid occurring in British Columbia.

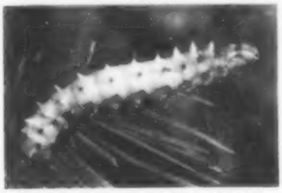

Dioryctria pseudotsugella p. 236
15 mm; s, c BC; Fd


Dioryctria reniculleloides p. 237
15 mm; BC; Se, Sw


Dolichomia thymetusalis p. 238
20 mm; c interior; Se, Sw


Promylea lunigerella p. 240
20 mm; s coast; Bg, Ba, Fd

Saturnidae (1 species) GIANT SILKWORM MOTHS

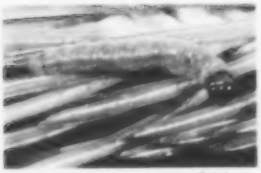


Hyalophora euryalis p. 242
90 mm; s BC; Fd, Bg

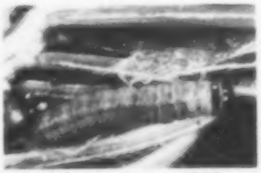
Mature larvae are very large, 80 mm to 90 mm long. Numerous brightly colored tubercles bearing spines on dorsum and sides of abdomen.

Tortricidae (31 species) LEAFROLLER MOTHS

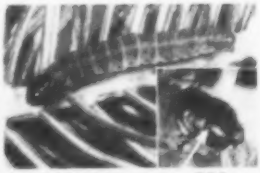
Mature larvae are small to medium sized, 7 mm to 25 mm long. Setae on intensely pigmented pinacula. Larvae often roll, fold or web foliage together. Larvae move violently backwards when disturbed.



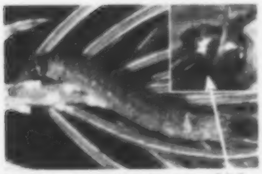
Acleris gloverana p. 244
16 mm; BC (not ne); Hw, Se+
Head, unmarked brown
or black



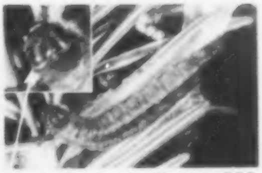
Acleris variana p. 246
16 mm; ne BC; Sw, Bl
Head, unmarked brown
or black



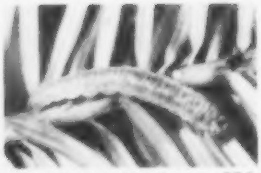
Archips tsugana p. 252
17 mm; s coast; Ss, Hw
Head, brown with
dark markings



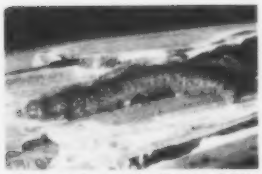
Archips packardiana p. 250
18 mm; interior; Se, Sw
Head, green with dark markings
Larva matures in June



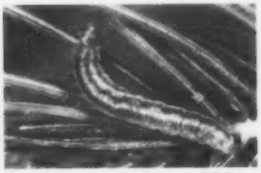
Argyrotaenia occultana p. 258
15 mm; interior; Se, Sw, Fd
Head, green with brown
markings
Larva matures in August



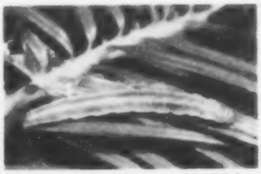
Argyrotaenia dorsalana p. 256
17 mm; s BC; Fd
Head, green with faint mottle
Larva matures in June



Argyrotaenia tabulana p. 260
15 mm; s, c interior; Pl
Larva feeds within webbed
bundle of needles

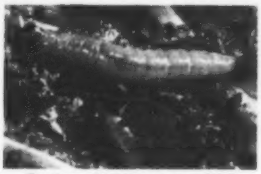


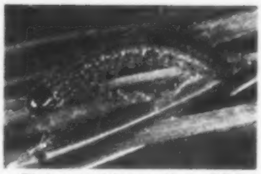
Clepsis persicana p. 272
18 mm; s, c BC; Se, Fd, Pl++

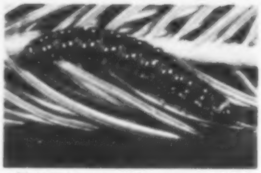


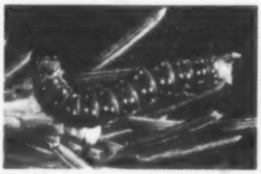
Syndemis afflictana p. 288
20 mm; s, c BC; Fd

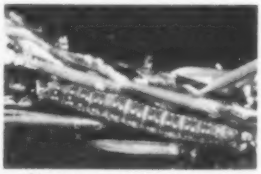
Photographic key - Lepidoptera

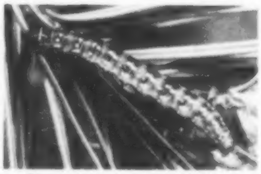

Taniva albolineana p. 290
8 mm; s, c interior; Se, Sw, So

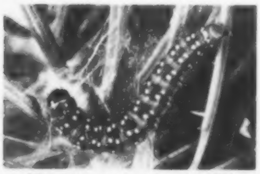

Platynota idaeusalis p. 286
19 mm; s interior; Pl

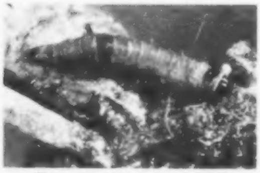

Choristoneura biennis p. 262
25 mm; s, c interior; Se, Bl+

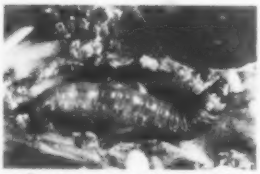

Choristoneura fumiferana
p. 264
24 mm; ne BC; Sw, Bl

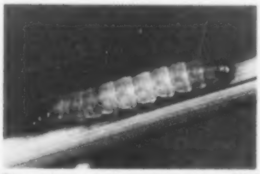

Choristoneura lambertiana
p. 266
18 mm; s interior; Pl

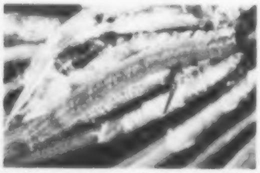

Choristoneura occidentalis
p. 268
25 mm; s, c BC; Fd+

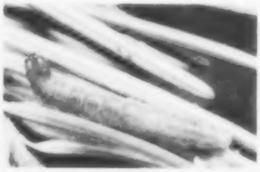

Choristoneura orae p. 270
25 mm; n coast; Ss, Ba

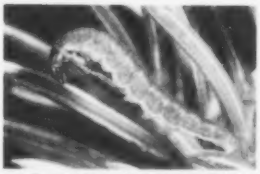

Epinotia nanana p. 278
8 mm; s coast; So

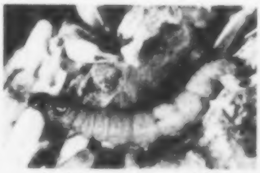

Epinotia subviridis p. 282
10 mm; s coast; Cw, Co, Jo

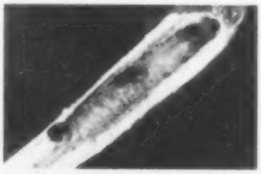

Rhyacionia subcervinana p. 287
8 mm; s interior; Py

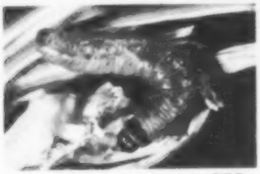

Argyrotaenia citrana p. 254
15 mm; s coast; Pl, Fd++


Ditula angustiorana p. 274
14 mm; s coast; Fd, Tw

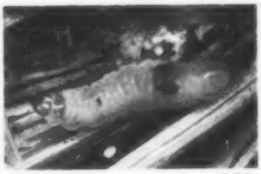

Epinotia radicana p. 280
9 mm; BC; Se, Sw, Fd


Archips alberta p. 248
15 mm; n, c interior; Sb

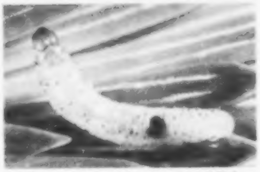

Epinotia tsugana p. 284
7 mm; s coast; Hw



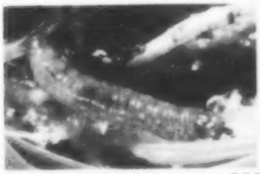
Epinotia hopkinsana p. 276
10 mm; coast; Ss, Pl



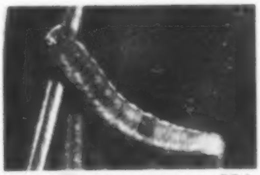
Zeiraphera canadensis p. 292
13 mm; s, c BC; Se, Sw, Ss
If collected on coast, rear to adult to confirm identification



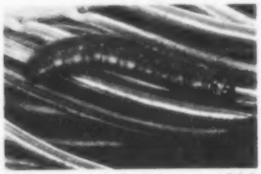
Zeiraphera pacifica p. 298
10 mm; QCI; Ss
Rear to adult stage to confirm identification



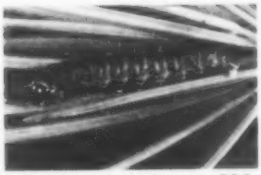
Zeiraphera vancouverana p. 302
10 mm; VI; Ss
Rear to adult stage to confirm identification



Zeiraphera hesperiana p. 294
15 mm; s, c BC; Fd

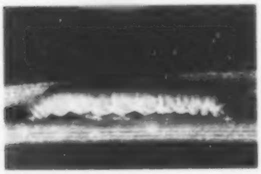


Zeiraphera unfortunana p. 300
15 mm; BC; Se, Sw, Ss

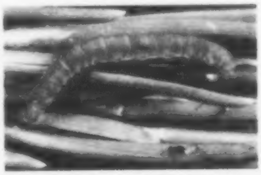


Zeiraphera improbana p. 296
10 mm; interior; Lw, Lt, La

Yponomeutidae (2 species) ERMINE MOTHS
Mature larvae are small, 7 mm to 14 mm long. Larvae are needleminers and needle tiers.



Ocnerostoma piniariella p. 304
7 mm; s coast; Pw

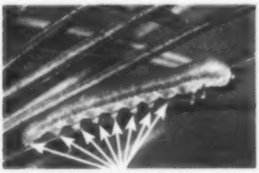


Zelleria haimbachi p. 306
14 mm; s, c BC; Pl, Py

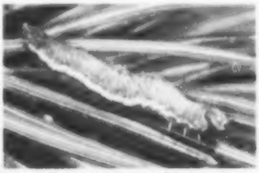
Hymenoptera: Suborder Symphyta SAWFLIES

The conifer-feeding sawflies of British Columbia include 20 species from 3 families.

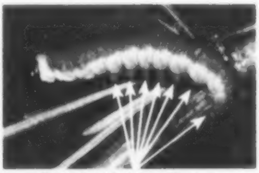
Symphyta Families: quick lookup photo gallery (3 families)



Diprionidae 6 spp.
p. 308–319
18 to 24 mm; 8 pairs prolegs
BC; many hosts



Pamphiliidae 6 spp.
p. 320–327
18 to 25 mm; no prolegs
BC; many hosts



Tenthredinidae 8 spp.
p. 328–338
13 to 20 mm; 7 pairs prolegs
BC; many hosts

Family descriptions and species of Symphyta (by family): quick lookup photo gallery

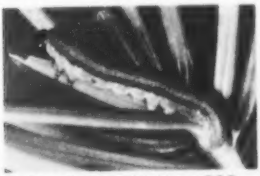
Hymenoptera: Symphyta SAWFLIES

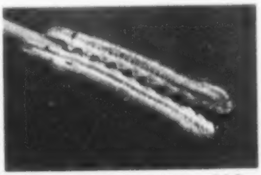
Each family is briefly described in alphabetic order. A photo gallery of all or nearly all of the family's species known to occur in British Columbia follows each description.

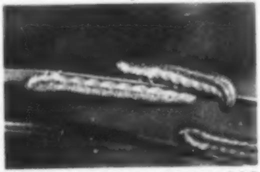
Select the photograph that most closely resembles your specimen and proceed to the species description to confirm your identification. When several similar species occur within a family, use the distinguishing characters provided under each photograph, as well as under the Similar Species heading within the species descriptions, to complete the identification. See also detailed species identification instructions on p. 15.

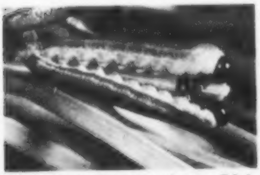
Diprionidae (6 species) CONIFER SAWFLIES

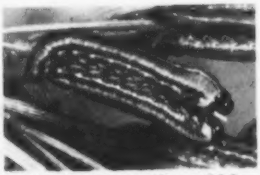
Mature larvae are medium sized, 18 mm to 25 mm long. Larvae of all species are very similar in appearance and can be distinguished from other families by number of prolegs: 8 pairs, compared to 7 pairs in the tenthredinids and none in the pamphilids.

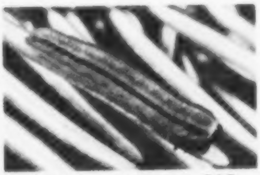

Neodiprion abietis p. 308
18 mm; BC; Se, Bl, Fd+


Neodiprion mundus p. 310
24 mm; s interior; Py


Neodiprion n. contortae p. 312
21 mm; BC; Pl

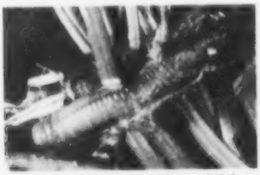

Neodiprion n. nanulus p. 314
21 mm; ne BC; Pj

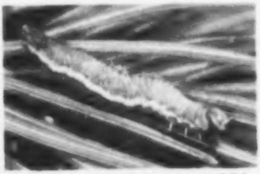

Neodiprion sertifer p. 316
25 mm; s coast; Po

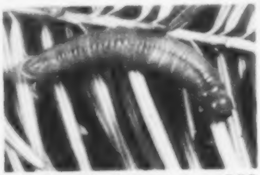

Neodiprion tsugae p. 318
18 mm; s, c BC; Hw

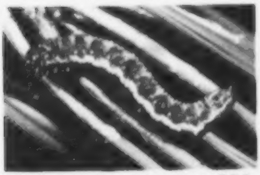
Pamphiliidae (6 species) WEBSPINNING SAWFLIES

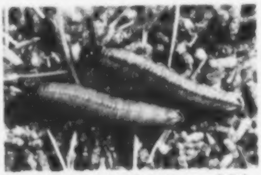
Mature larvae are medium sized, 18 mm to 25 mm long. Larvae are green or brown and may feed gregariously or singly. Pamphiliid larvae differ from other sawfly larvae in that they lack prolegs, have well-developed antennae, and have a pair of three-segmented appendages on the last segment of the body.

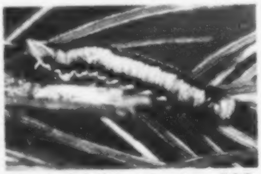

Acantholyda atrata p. 320
18 mm; s, c BC; Bg, Bl


Acantholyda balanata p. 321
18 mm; s, c BC; Se, Ss, Py+


Acantholyda bucephala p. 322
18 mm; s coast; Fd

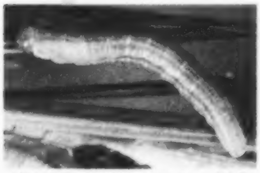

Acantholyda verticalis p. 323
18 mm; s, c BC; Py, Pl


Cephalcia californica p. 324
25 mm; s BC; Py, Pl, Po+

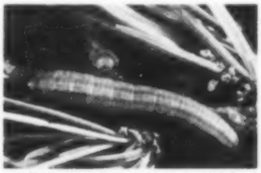

Cephalcia fascipennis p. 326
20 mm; s, c interior; Se, Sw

Tenthredinidae (7 species) TENTHREDINID SAWFLIES

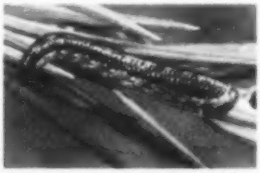
Mature larvae are medium sized, 13 mm to 20 mm long. Larvae vary in color from green to brown to grey, and can be distinguished from other sawfly families by having 7 pairs of prolegs, compared to 8 pairs in the diprionids and none in the pamphilids.



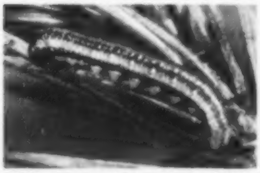
Anoplonyx laricivorus p. 328
14 mm; s interior; Lw



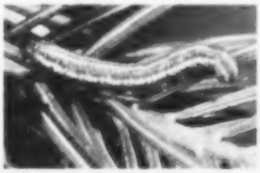
Anoplonyx luteipes p. 330
15 mm; ne BC; Lt



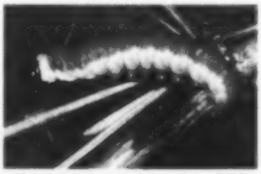
Anoplonyx occidens p. 332
21 mm; s interior; Lw



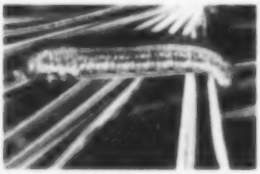
Pikonema alaskensis p. 333
20 mm; BC; Se, Sw, Ss



Pikonema dimmocki p. 334
20 mm; BC; Se, Sw, Ss



Pristiphora erichsonii p. 336
16 mm; BC; Lw, Lt, Lo



Pristiphora leechi p. 338
13 mm; s interior; Lw

Species Descriptions

Lophocampa argentata (Packard)
Silverspotted tiger moth

Hosts: Principal host is Douglas-fir; other hosts include western hemlock, grand fir, amabilis fir, lodgepole pine, Sitka spruce and eastern white-cedar.

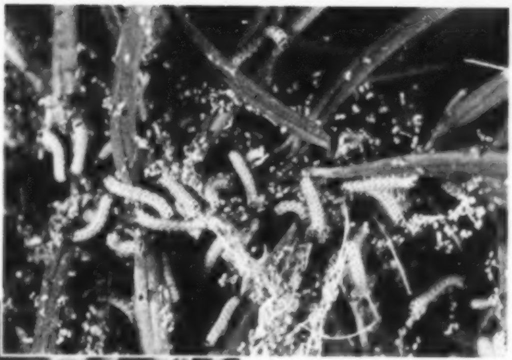
Distribution: Throughout the range of the principal host in south coastal British Columbia; south to California.

Description: Mature larva up to 37 mm long. Head, black unmarked. Body, black with middorsal tufts of black hairs, subdorsal clusters of yellow hairs and lateral clusters of rust-colored hairs. Long lateral tufts of black hairs on the first and second abdominal segments.

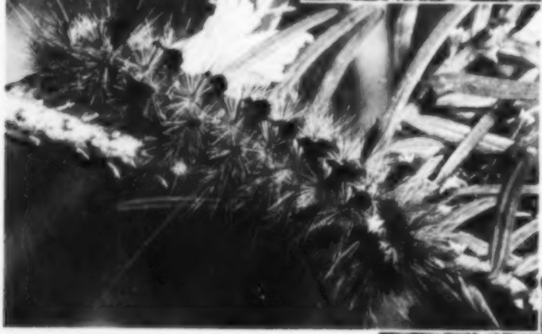
Bionomics: This species overwinters as a third- or fourth-instar larva. Caterpillars feed sporadically throughout the winter in small 10- to 20-cm-long tents. Larval feeding increases in early spring (mid-February to March) as the weather warms. A colony usually remains on one branch, completely stripping it of needles for 1.0 to 1.5 m from the tip. Occasionally, a colony will move to and defoliate a second branch in February or March. By mid-April, the larvae leave the nest, become solitary in habit and continue to feed for another 2 to 3 weeks. During May and June, the mature larvae are often observed wandering on the ground as they seek out sheltered locations to spin cocoons and pupate. Adults emerge from mid-July to mid-August. Females lay up to 450 eggs in clusters along needles and twigs. Eggs hatch from mid-August to mid-September. First- and second-instar larvae feed gregariously inside a loose 5- to 10-cm-long web during the fall.

Damage: The silverspotted tiger moth is a common and occasionally damaging tent-forming defoliator. Normally, only 1 to 3 tents occur on a tree, but occasionally a large number of tents can be found on individual trees. Damage usually occurs on open-grown trees in urban or park-like settings and tends to be mostly aesthetic as the buds on defoliated branches remain undamaged and grow normally during the spring flush. By midsummer, the fully elongated current-year growth makes it difficult to detect defoliated branches.

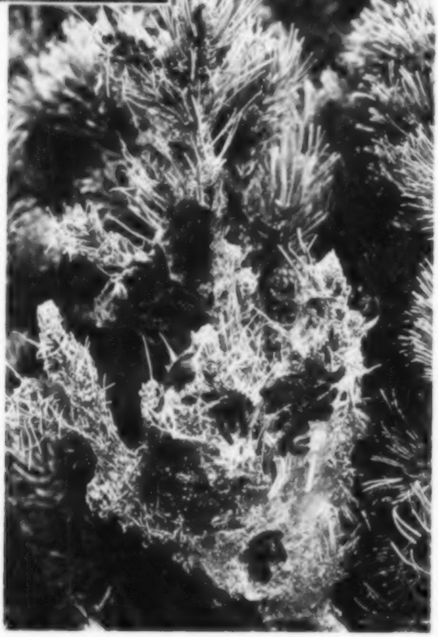
Similar species: *Orgyia* spp. (p. 176–179), *Dasychira grisefacta* (p. 174) and *Panthea* spp. (p. 212–215) all have larvae covered with long hairs arranged in prominent clusters or tufts. Although superficially similar to these species, a silverspotted tiger moth larva can easily be distinguished on the basis of its distinctive color, arrangement of body hairs, nest-building habit, and season.



Early instar larvae in fall nest on Douglas-fir



Dorso-lateral view of mature larva on Douglas-fir



Colony of penultimate-instar larvae feeding on lodgepole pine

Argyresthia cupressella Walsingham
Cypress tip moth

Hosts: Principal hosts are Chinese juniper, Leyland cypress, Lawson-cypress, Monterey cypress, Rocky Mountain juniper, eastern redcedar and eastern white-cedar.

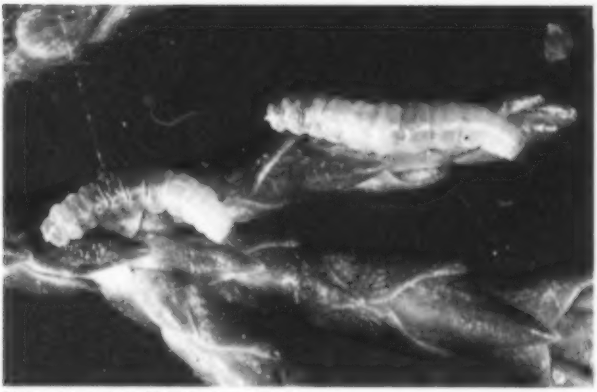
Distribution: Introduced, native to California. South coastal British Columbia; south to California. Recently established in Britain.

Description: Mature larva up to 6 mm long. Head and prothoracic shield, pale brown. Body, unmarked, pale yellowish green.

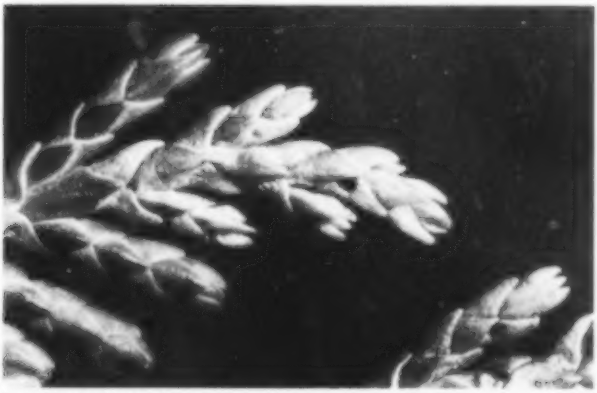
Bionomics: This species overwinters within a mined shoot as a third- to fourth-instar larva. Larvae continue to feed on warm winter days. Larval feeding activity increases in early spring (March to April) as the weather warms. Once feeding is completed (early to mid-May), the larvae leave their mines and spin a white paper-like cocoon on live or dead foliage. The pupal stage lasts about 2 weeks. Adults emerge in June, mate and begin laying eggs. Males live 8 days on average and females 9.6 days. Up to 33 eggs (mean 15) are laid individually on green tips of twigs in late spring and early summer. Eggs require an average of 3 weeks for incubation. Larvae tunnel into individual scale leaves, mining 9 to 12 scales between summer and late winter. By early spring, the larvae bore into shoots 0.3 to 2.0 cm from the tip and tunnel 0.5 to 2.5 cm down the shoot and occasionally into a lateral shoot. Each larva may affect 4 to 6 shoots in this way. Affected shoots become brown and die when vacated. The larval period lasts 10 months.

Damage: The cypress tip moth can cause severe and highly visible damage (shoot tip dieback and foliar scorch) to infested trees. Damage commonly occurs on hedges and individual specimen trees in urban settings. Damage caused by early instar larvae (mined scale leaves) usually goes unnoticed. Late-instar larvae hollow entire shoot tips. Infested trees appear scorched from April until the new flush of growth masks the damage in June. The dead, hollowed twigs are easily broken off.

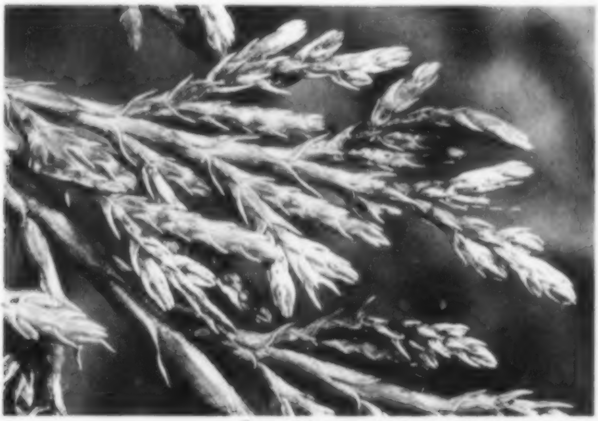
Similar species: Cypress tip moth is the only species with a green larva that mines juniper, cypress or cedar foliage currently known to occur in coastal British Columbia. Early instar larvae of *Epinotia subviridis* also mine juniper, cypress or cedar shoot tips. The larva of this species, however, is dark brown (p. 282).



Mature larvae on Monterey cypress



Individual mine on Leyland cypress



Typical feeding damage on Leyland cypress

Aethes rutilana (Hübner)
Pale juniper webworm

Host: Common juniper.

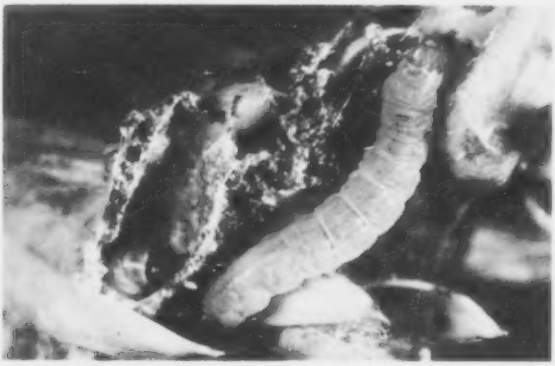
Distribution: Introduced Eurasian species. Southeastern interior of British Columbia; southern Alberta, Ontario to Nova Scotia and south to Connecticut and Ohio. Old World distribution includes most of Europe and Japan.

Description: Mature larva up to 8 mm long. Head, orange–brown. Body, unmarked, pale yellow to yellowish orange.

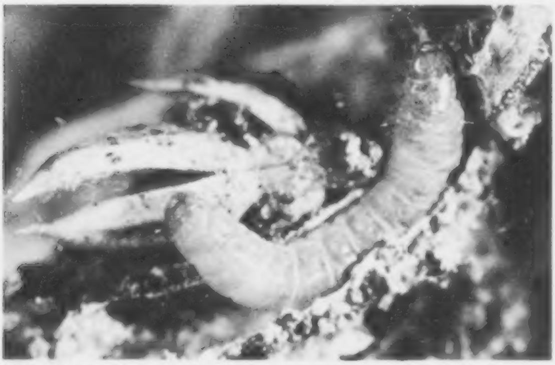
Bionomics: This species overwinters as a mid-instar larva in a frass-covered, silk-lined tube attached to a twig. In spring, the larva resumes feeding, hollowing the concave lower surface of needles and spinning extensive webbing around the feeding area. Mature larvae are present from May to June. Pupation occurs in the feeding tubes; adults emerge from late May to June, mate and lay eggs. The eggs hatch soon after. The larvae mine needles until the onset of cooler conditions.

Damage: The pale juniper webworm can cause severe and highly visible damage to infested common juniper in both natural and landscaped settings. Feeding nests consist of extensive masses of dead needles and associated webbing along branches. This species is a wasteful feeder and, therefore, a relatively small number of larvae can cause extensive damage. Repeated attacks are almost certain to weaken severely affected trees.

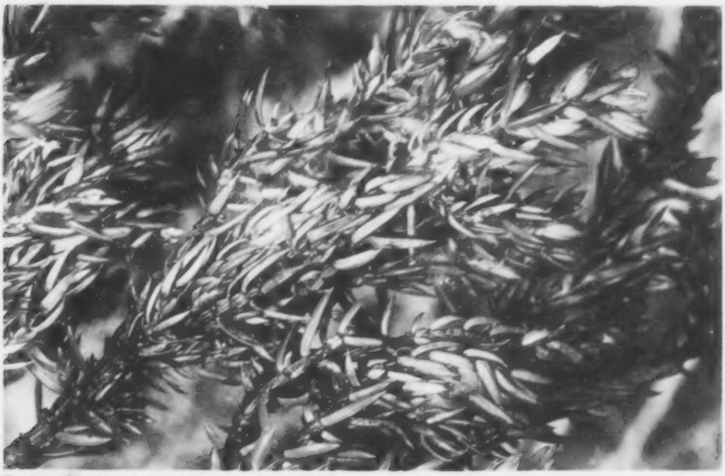
Similar species: The juniper webworm, *Dichomeris marginella* (p. 64), causes similar damage on common juniper. The 2 species can easily be distinguished on the basis of larval size, color and markings.



Mature larva on common juniper



Mature larva on common juniper



Typical feeding damage on common juniper

Coleophora laricella (Hübner)
Larch casebearer

Hosts: Western larch in British Columbia; tamarack in eastern North America; Eurasian species of larch in the Old World.

Distribution: Introduced Eurasian species. Throughout the range of western larch in the southern interior of British Columbia; southeast Manitoba to Nova Scotia and Newfoundland, and south to Massachusetts, Michigan and Washington. The Old World distribution includes much of Eurasia and Japan. This species was inadvertently introduced and temporarily established on larch planted as ornamentals in Victoria. Suppression efforts successfully eradicated this population. It is not currently known to be established on the coast.

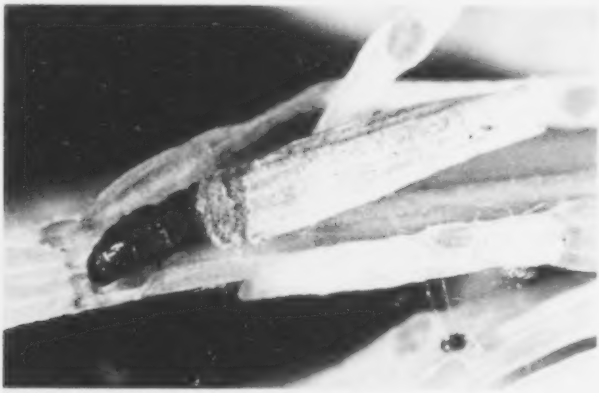
Description: Mature larva up to 6 mm long. Head and prothoracic shield, black. Body, unmarked, dark purplish brown.

Bionomics: This species overwinters as a mid-instar larva concealed in a cigar-shaped case attached to a twig. The case is formed from part of a mined larch needle. The larva begins to mine new needles as soon as growth begins in spring. The larva attaches its case to a new needle and mines as much of the needle as it can reach from the case. Several needles are mined in this fashion between mid-April and late May. As the larva grows, it vacates the overwintering case and moves into a larger case. Pupation occurs in the case in late May and adults emerge soon after. Eggs are deposited one or more to a needle in June. The eggs hatch in about 2 weeks. The newly emerged larva mines a needle until late summer, when it forms an overwintering case from a silk-lined, hollowed segment of the needle.

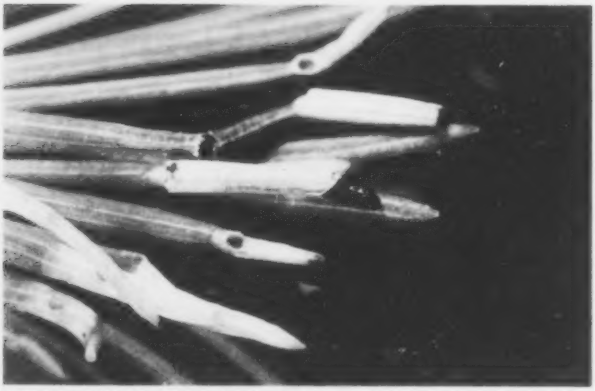
Damage: Larch casebearer infestations were first observed in British Columbia in 1966. Damaging infestations were observed along a broad front extending north from infested areas in the western United States to include much of the boundary area, from Grand Forks in the west to Yahk in the east. Within 5 years, the infestation had spread throughout most of the range of western larch from the south Okanagan to Cranbrook, and north to Slocan. Populations have fluctuated considerably and, in some years, defoliation was recorded on more than 60 000 ha. Several species of parasitoids were released at some sites in 1969; *Agathis pumila* (Ratz.) and *Chrysocharis laricinellae* (Ratz.) are now well established throughout the current range of the larch casebearer in British Columbia and exert considerable control pressure.

During infestations, extensive needle mining causes the tips of needles to turn brown and causes infested trees to appear scorched. Larch are generally able to withstand defoliation reasonably well; however, several consecutive years of severe defoliation will likely reduce growth and may kill some branches and twigs. Severely defoliated trees normally produce a new flush of foliage in summer.

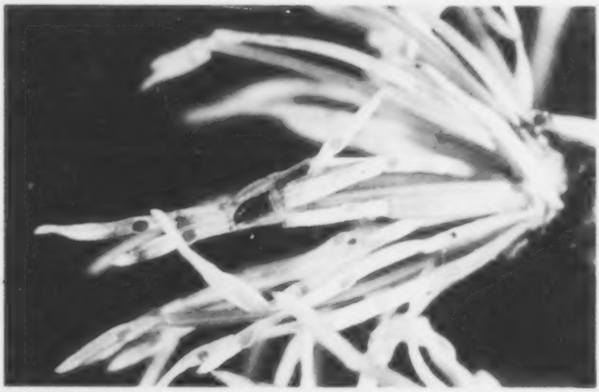
Similar species: No similar species occur in British Columbia. Damage caused by the disease, larch needle cast (*Hypodermella laricis* Tubeuf), appears superficially similar, but lacks evidence of insect activity.



Mature larva and case on western larch



Mined needle tips with mature larvae on western larch



Feeding damage on western larch

Chionodes continuella (Zeller)

Hosts: Engelmann spruce and white spruce.

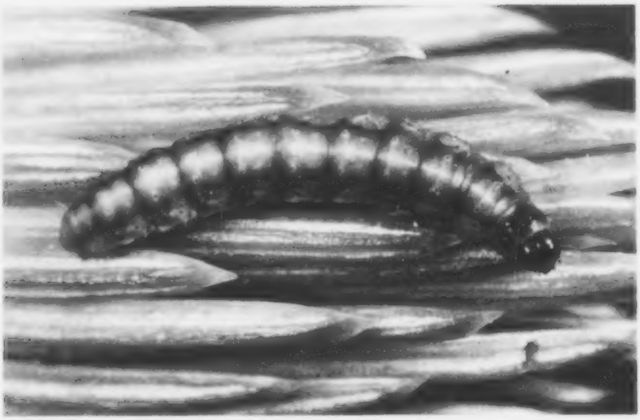
Distribution: Holarctic. Throughout the host range in the interior of British Columbia; east to Newfoundland, north to the Yukon, and south to New York and Washington; also Eurasia.

Description: Mature larva up to 14 mm long. Head and prothoracic shield, dark brown. Body, rusty brown; cream-colored middorsal stripe, irregular cream-colored markings in the spiracular area.

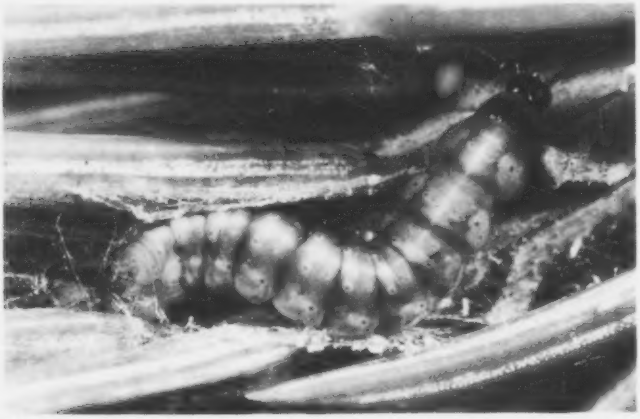
Bionomics: Appears to overwinter in the egg stage. Larvae are present from June to July, pupation occurs in mid-July, and adults emerge in late July.

Damage: *Chionodes continuella* is a rather uncommon, solitary defoliator.

Similar species: No similar species occur in British Columbia.



Dorsal view of mature larva on Engelmann spruce



Dorso-lateral view of mature larva on Engelmann spruce

Chionodes retiniella (Barnes & Busck)

Host: Ponderosa pine.

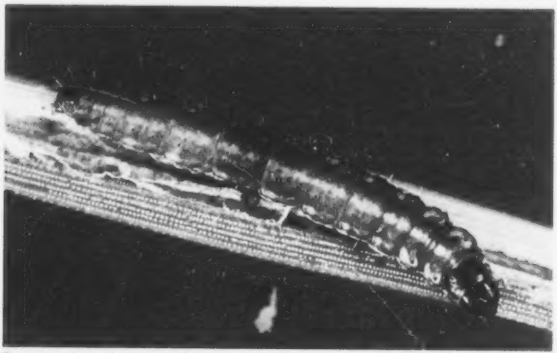
Distribution: Throughout the host range in the southern interior of British Columbia; east to South Dakota and south to California.

Description: Mature larva up to 14 mm long. Head and prothoracic shield, black. Body, brown; creamy white middorsal stripe, supraspiracular spots and broken spiracular stripe.

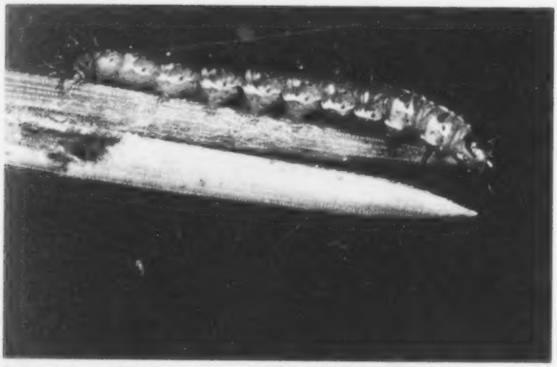
Bionomics: This species overwinters as a mid-instar larva within a bundle of needles that are webbed together. In April, the larva continues to feed within the bundle. At maturity (late April to early May), the larva migrates once more and without feeding; it ties 9 to 19 needles together to form a bundle within which pupation occurs in May. Adults emerge during June, mate and lay eggs. The larva emerges in July and mines the apical portions of several needles, ejecting the frass through the entrance hole. Later, the larva ties up to 6 needles into a bundle, using 3 to 6 previously mined and 2 to 4 adjacent unmined needles.

Damage: Feeding by *Chionodes retiniella* causes the affected needles in the feeding shelter to dry out and turn reddish brown. Although this damage is noticeable, it is unusual to find more than 3 to 4 feeding shelters in a tree.

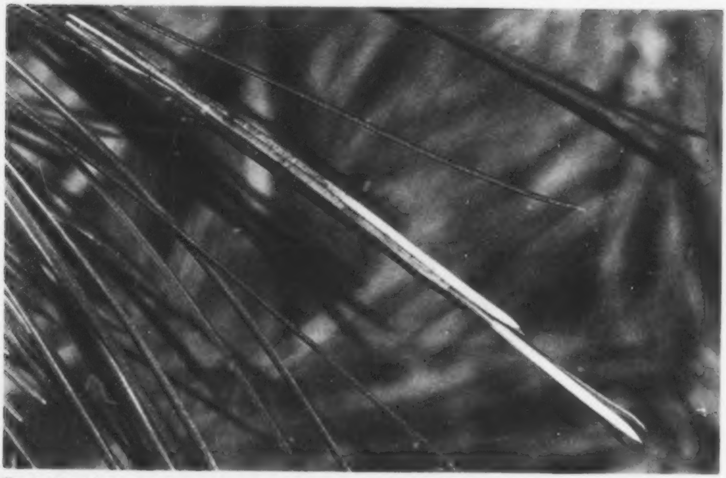
Similar species: No similar species occur in British Columbia. *Ocnerostoma piniariella* (p. 304) causes similar damage, but occurs on white pine.



Dorsal view of mature larva on ponderosa pine



Lateral view of mature larva on ponderosa pine



Typical feeding damage on ponderosa pine

Coleotechnites sp.

Host: Douglas-fir.

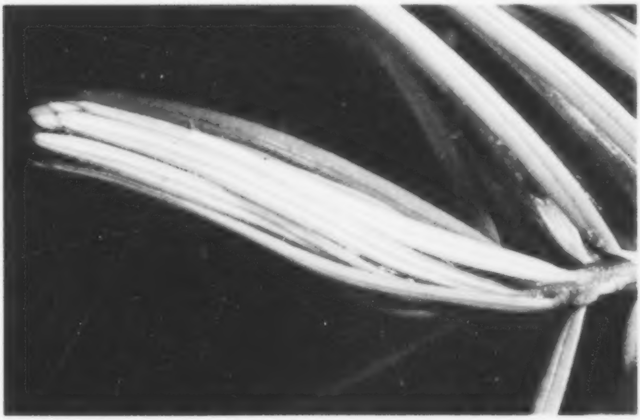
Distribution: South coastal British Columbia.

Description: Mature larva up to 5 mm long. Head and prothoracic shield, brown. Body, unmarked yellowish brown.

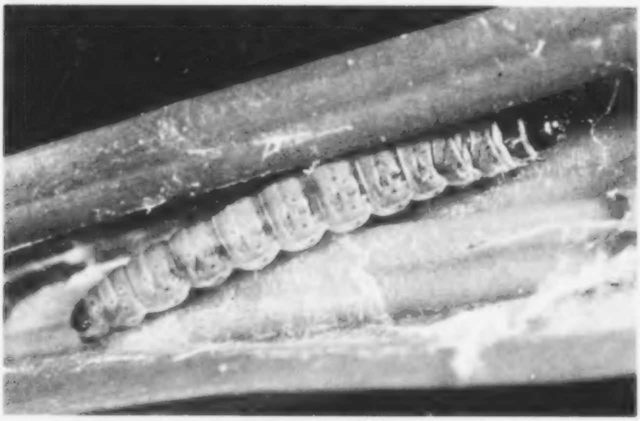
Bionomics: Overwintering habits are unknown. In the spring during bud break, the larva migrates to the expanding new flush where it ties several needles together to form a feeding shelter. The larva feeds within the shelter from late April to mid-May. Pupation occurs in a silken tube within the feeding shelter in late May. Adults emerge from early to mid-June.

Damage: Individual feeding shelters typically consist of 8 to 14 webbed-together needles. In some years, large numbers of newly flushed shoots may be affected on individual infested trees.

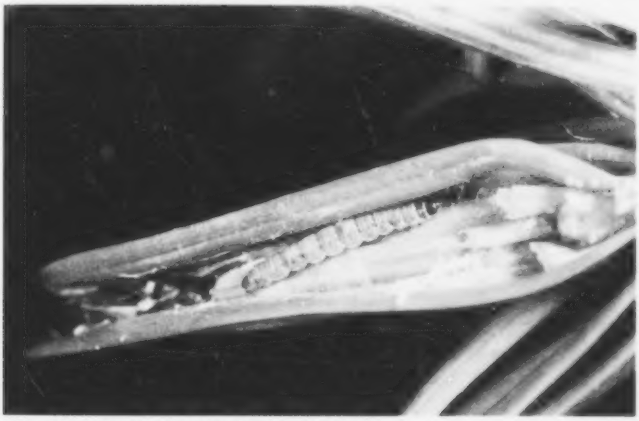
Similar species: No similar species occur on Douglas-fir in British Columbia. *Ditula angustiorana* (p. 274) produces somewhat similar feeding shelters on Douglas-fir; the mature larva of *D. angustiorana*, however, is much larger.



Typical feeding shelter on Douglas-fir



Dorso-lateral view of mature larva on Douglas-fir



Mature larva exposed in feeding shelter on Douglas-fir

Coleotechnites nr. apicitripunctella (Clemens)

Hosts: Western hemlock; *Coleotechnites apicitripunctella* occurs on eastern hemlock in eastern North America.

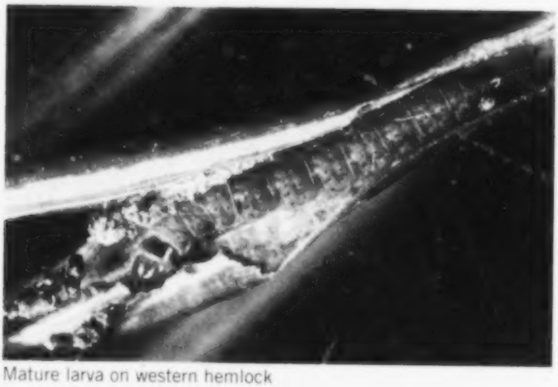
Distribution: Throughout the host range in south coastal British Columbia and south to Washington; *C. apicitripunctella* occurs throughout much of the range of eastern hemlock in eastern North America.

Description: Mature larva up to 7 mm long. Head and prothoracic shield, chestnut brown. Body, yellowish green, becoming orange–red in last 3 segments.

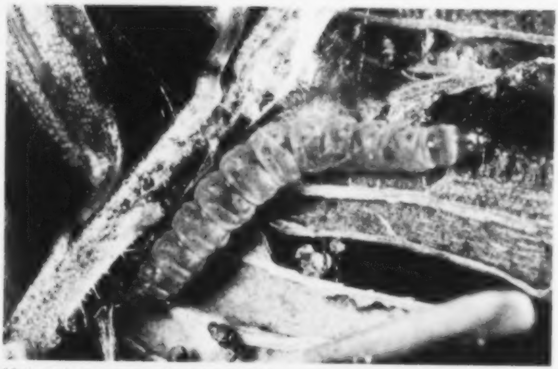
Bionomics: This species overwinters as a mid-instar larva in a hollowed needle in its feeding nest. In the spring, the larva hollows the undersides of additional needles, which are bound together with silk. Mature larvae are present from April to May. The pupa is formed in a silken tube within the feeding web in late May. Adults emerge in June, mate and lay eggs on host foliage. Larvae hatch soon after. The young larva initially mines a series of adjacent needles and ties them loosely together with silk.

Damage: Individual feeding nests typically consist of 8 to 15 hollowed and webbed-together needles. *Coleotechnites nr. apicitripunctella* can, in some years, cause visible damage on individual infested trees.

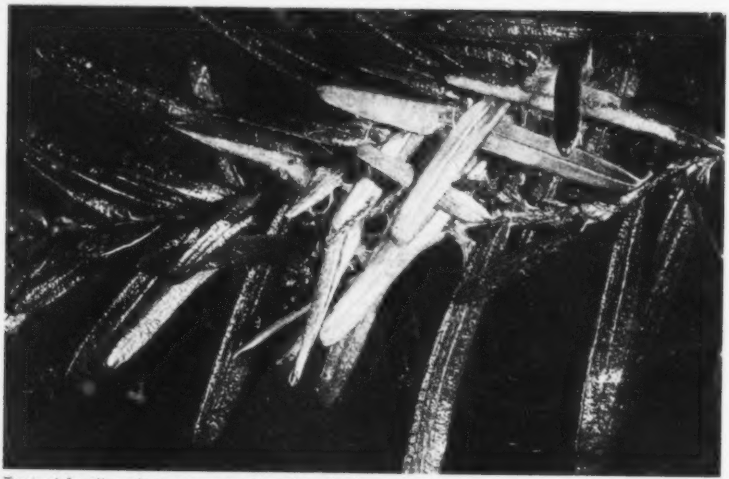
Similar species: *Coleotechnites nr. macleodi* (p. 60) causes similar damage on western hemlock. The 2 species can be distinguished on the basis of larval color. The larva of *C. nr. apicitripunctella* is yellowish green, whereas the larva of *C. nr. macleodi* is purplish brown.



Mature larva on western hemlock



Mature larva on western hemlock



Typical feeding damage on western hemlock

Coleotechnites atrupictella (Dietz)

Hosts: Principal hosts are Douglas-fir and Engelmann spruce; other hosts include white spruce, black spruce, western hemlock and subalpine fir.

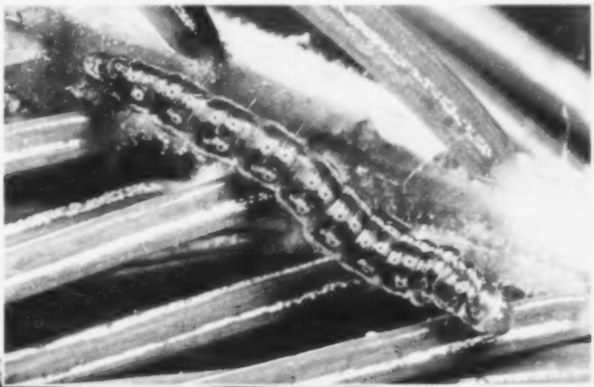
Distribution: Throughout British Columbia from the Nass and upper Fraser drainages south; east to Nova Scotia and Newfoundland.

Description: Mature larva up to 12 mm long. Head, brown unmarked. Body, red; creamy white addorsal and lateral stripes; creamy white lateral markings.

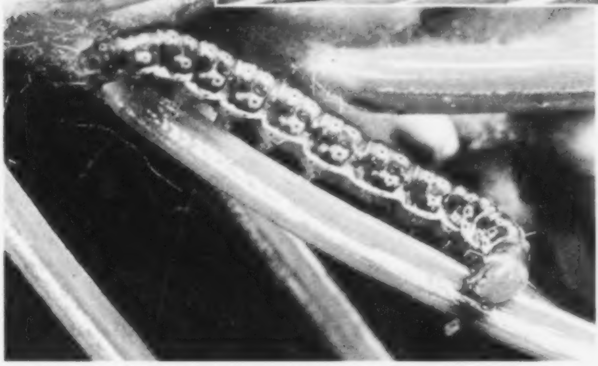
Bionomics: Overwintering habits are unknown. Larvae are present from June to July. The larva feeds on the new flush within a frass-filled silken tube, hollowing the undersides of several needles, which it binds together with silk. The pupa is formed in a silken tube within the feeding web in late June or July, and adults emerge from July to August.

Damage: *Coleotechnites atrupictella* is a relatively uncommon, solitary defoliator.

Similar species: *Coleotechnites canusella* (p. 57) is similar, but is smaller and occurs on a different host.



Dorso-lateral view of mature larva on Engelmann spruce



Lateral view of mature larva on Engelmann spruce

Coleotechnites canusella (Freeman)

Host: Lodgepole pine.

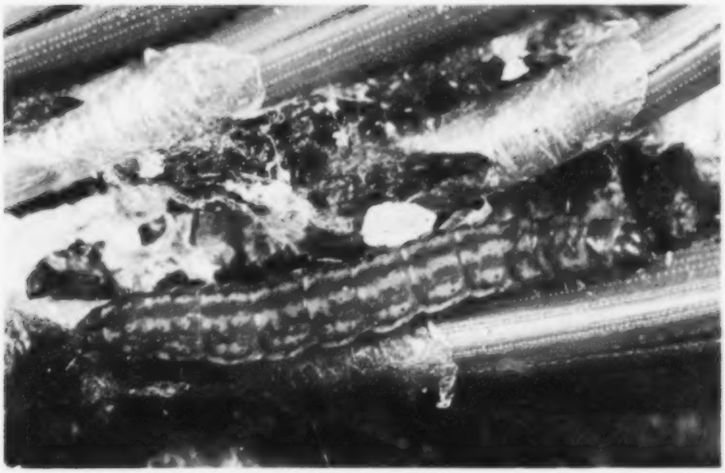
Distribution: Southern interior of British Columbia; south to Washington.

Description: Mature larva up to 9 mm long. Head, brown unmarked. Body, red; reddish white addorsal and lateral stripes; reddish white lateral markings.

Bionomics: Little is known of the biology of this species in British Columbia. Larvae are present from June to July, and adults emerge from July to August. Larvae are needleminers.

Damage: *Coleotechnites canusella* is a relatively uncommon needleminer, but it may be locally abundant in some years.

Similar species: *Coleotechnites atrupictella* (p. 56) is similar, but is larger and occurs on different hosts.



Dorso-lateral view of mature larva on lodgepole pine

Coleotechnites granti Freeman

Hosts: Principal host is grand fir; other hosts include amabilis fir and subalpine fir.

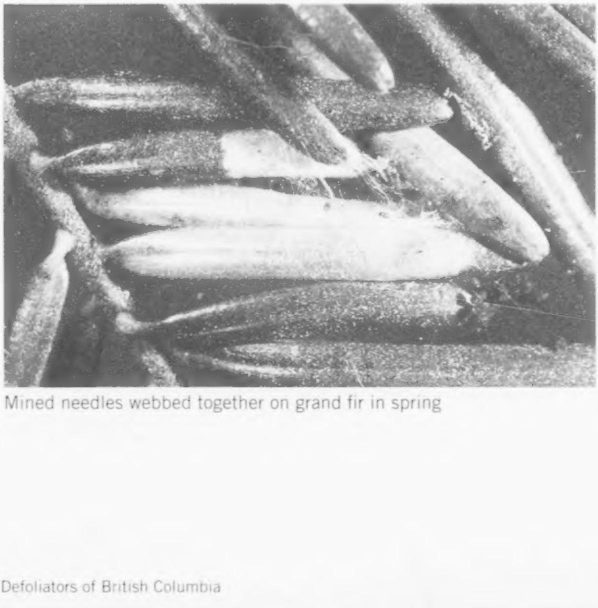
Distribution: Southeastern interior of British Columbia; south to Washington.

Description: Mature larva up to 6 mm long. Head and prothoracic shield, brown unmarked. Body, yellowish brown becoming reddish brown in the last 3 segments.

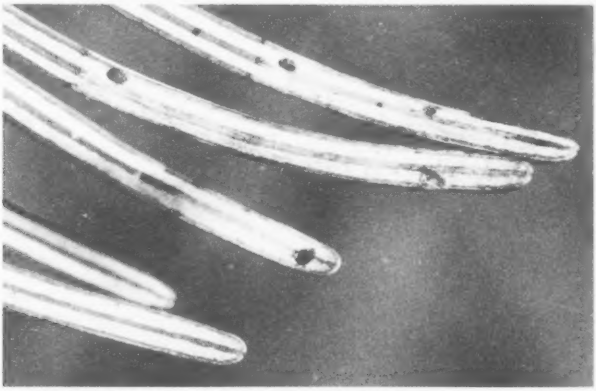
Bionomics: This species overwinters as a mid-instar larva in a mined needle and resumes mining the previous year's needles in the spring. Several needles are mined and loosely tied together with silken strands. A preferred mining location is where adjacent needles overlap. Pupation occurs among the mined needles in June. Adults emerge from late June to early July, mate and lay eggs. The larva enters a needle from the undersurface, often near the apex or between the apex and the middle. Usually there is only 1 hole in each needle, and all the frass is ejected.

Damage: *Coleotechnites granti* can, in some years, cause visible damage on individual infested trees. Individual feeding nests typically consist of 4 to 5 hollowed and webbed-together needles.

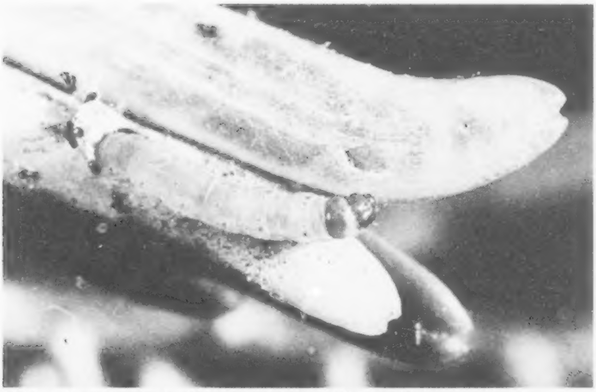
Similar species: No similar species occurs on true firs (*Abies* spp.) in British Columbia.



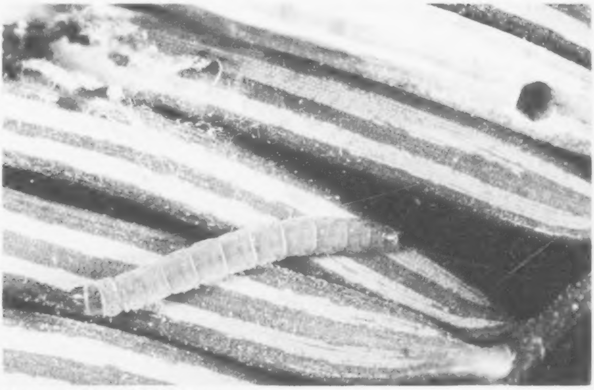
Mined needles webbed together on grand fir in spring



Needles mined by overwintering mid-instar larvae



Mature larva emerging from mined grand fir needle



Mature larva on grand fir

Coleotechnites nr. macleodi (Freeman)

Hosts: Western hemlock; *Coleotechnites macleodi* occurs on eastern hemlock in eastern North America.

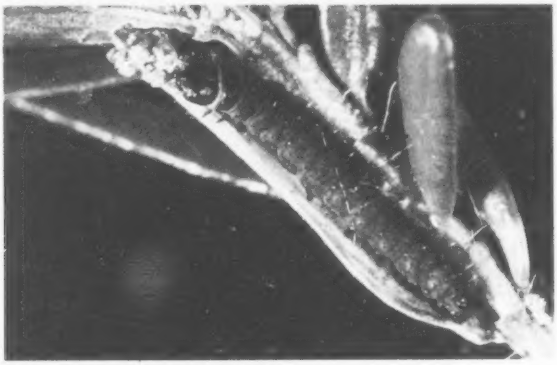
Distribution: Throughout the host range in south coastal British Columbia; south to Washington; *C. macleodi* occurs throughout much of the range of eastern hemlock in eastern North America.

Description: Mature larva up to 7 mm long. Head and prothoracic shield, rusty brown. Body, purplish brown, becoming reddish brown in the last 3 segments.

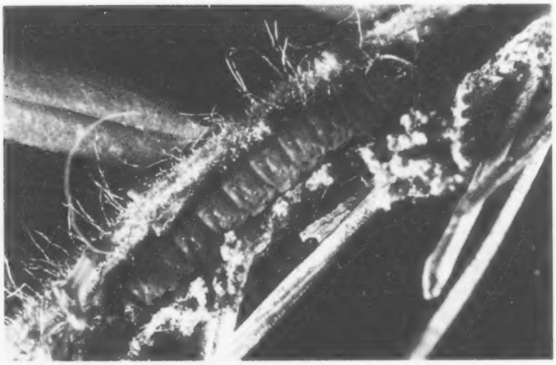
Bionomics: This species overwinters as a mid-instar larva in a hollowed needle in its feeding nest. In the spring, the larva hollows the undersides of additional needles, which also are bound together with silk. Mature larvae are present from April to May. The pupa is formed in a silken tube within the feeding web in late May. Adults emerge in June, mate and lay eggs on host foliage. Larvae hatch soon after. The young larva initially mines a series of adjacent needles and ties them loosely together with silk.

Damage: *Coleotechnites nr. macleodi* can, in some years, cause visible damage on individual infested trees. Individual feeding nests typically consist of 8 to 15 hollowed and webbed-together needles.

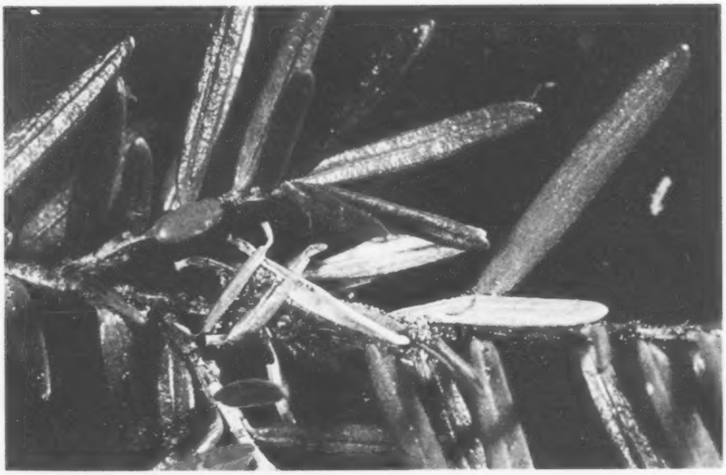
Similar species: *Coleotechnites nr. apicitripunctella* (p. 54) causes similar damage on western hemlock. The 2 species can be distinguished on the basis of larval color: the larva of *C. nr. macleodi* is purplish brown; the larva of *C. nr. apicitripunctella* is yellowish green.



Mature larva on western hemlock



Mature larva on western hemlock



Typical feeding damage on western hemlock

Coleotechnites starki (Freeman)
Northern lodgepole needleminer

Host: Lodgepole pine.

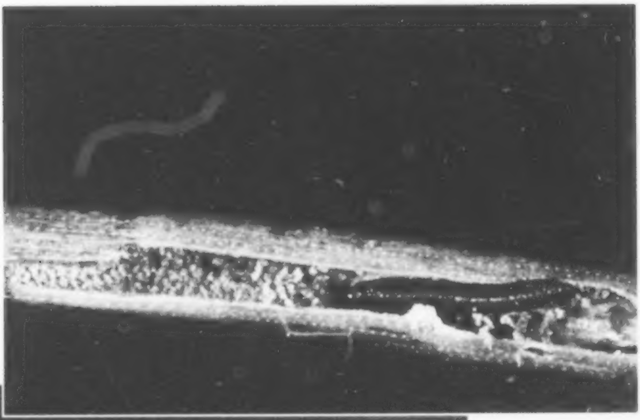
Distribution: Mid to high elevations in the Rocky Mountains of eastern British Columbia immediately adjacent to the Alberta border; mountainous western Alberta, the Cypress Hills, and south to Montana.

Description: Mature larva up to 6 mm long. Head and prothoracic shield, black. Body, unmarked purplish brown.

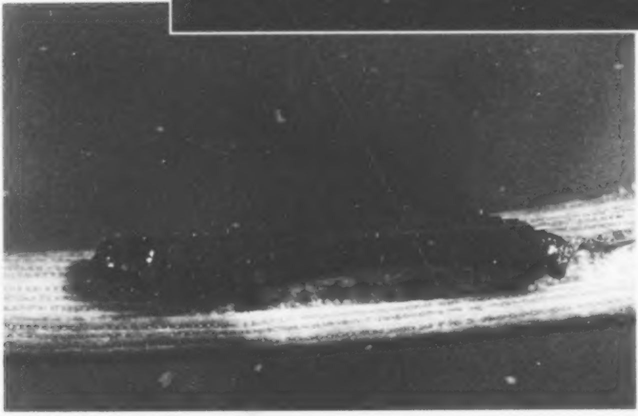
Bionomics: This species has a 2-year life cycle. The first-instar larva overwinters in a small mine near the needle tip. The larva resumes feeding in the spring and, by fall, will have mined 2 needles. The larva, now in the fourth instar, overwinters a second year. The following spring, the larva mines a third needle and pupates within the mine in June. Adults emerge in late June or July, mate and lay eggs near the base of a needle. Upon hatching, the larva bores into the tip of a new needle in late August or early September. Usually only 1 larva enters each needle.

Damage: Long, sustained and destructive outbreaks of the northern lodgepole needleminer occur sporadically in western Alberta, usually in extensive stands of mature lodgepole pine. Although defoliation may be severe, growth reduction is the principal effect. Early instar larvae affect only the tips of the needles, causing them to turn reddish brown. The needles mined by older larvae persist for a considerable period of time. The damage to affected stands is therefore quite noticable, especially during flight years. Annual incremental growth loss in trees in heavily infested stands has ranged from 20 to 75 percent.

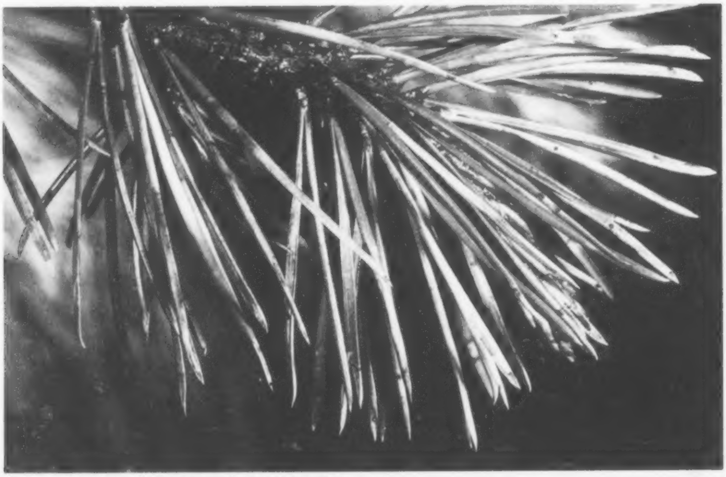
Similar species: No similar species occur on lodgepole pine in British Columbia.



Mid-instar larva on mined lodgepole pine needle



Mature larva on mined lodgepole pine needle



Typical feeding damage on lodgepole pine

Dichomeris marginella (Fabricius)
Juniper webworm

Hosts: Principal host is common juniper; other hosts include Chinese juniper, creeping juniper, eastern redcedar and Himalayan juniper.

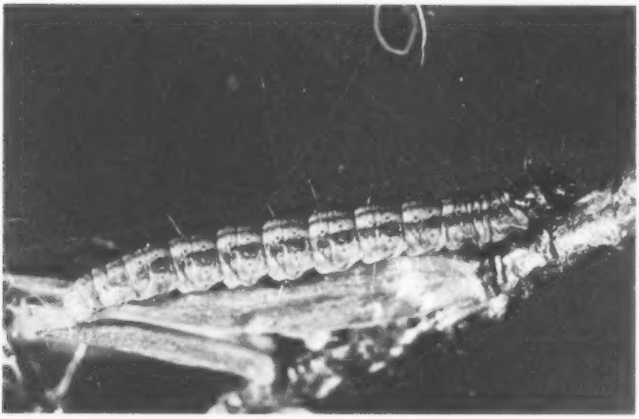
Distribution: Introduced Eurasian species. South coastal and southern interior of British Columbia; Ontario to Nova Scotia and south to South Carolina and California. Old World distribution includes most of Europe and Japan.

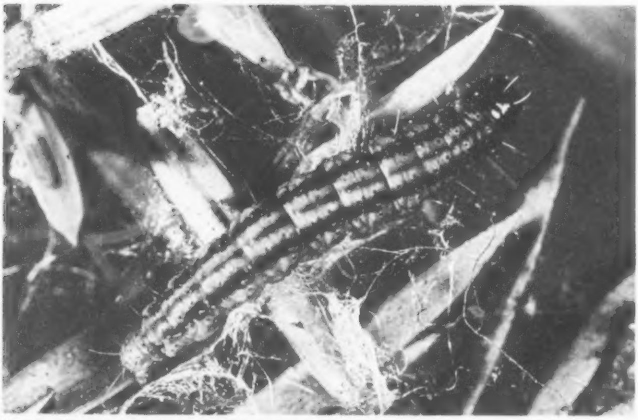
Description: Mature larva up to 14 mm long. Head, dark brown. Prothoracic shield, rusty brown with dark posterior margin. Body, light brown with dark reddish brown middorsal and subdorsal stripes.

Bionomics: This species overwinters as a mid- to late-instar larva in a silken case within webbed masses of foliage. In the spring, the larva continues to feed by hollowing needles in a communal web of dead needles and frass. Considerable amounts of foliage may be spun together. Mature larvae are present from May to June. Pupation occurs in a silken cocoon in the webbed foliage in early June. Adults are in flight from June to July. After mating, the females lay 50 to 200 eggs singly near the bases of needles on new terminal growth. Eggs hatch in 9 to 16 days. The young larvae initially feed as needleminers. As the larvae grow, they feed outside the mined needle and spin webs of silk, tying foliage and dead needles together in masses. The larvae continue to feed until fall. A nest may contain up to 15 larvae.

Damage: The juniper webworm can cause severe and highly visible damage to infested junipers. Large masses of dead needles and extensive webbing make trees look unhealthy.

Similar species: The pale juniper webworm, *Aethes rutilana* (p. 44), causes similar damage on common juniper. The 2 species can easily be distinguished on the basis of larval size, color and markings.


Dorso-lateral view of mature larva on common juniper


Mature larva in nest on common juniper

Caripeta aequaliaria Grote

Hosts: Principal hosts are Douglas-fir, ponderosa pine and lodgepole pine; also occurs on western white pine.

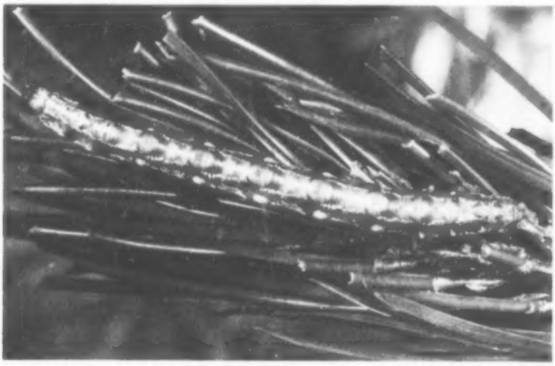
Distribution: Southern British Columbia; east to mountainous southwestern Alberta and south to California.

Description: Mature larva up to 46 mm long. This species has 2 distinct color pattern forms. The color of the more common form is highly variable, with a continuum of color variants ranging from dark brown to pale grey. The head of this form is pale grey to brown with dark markings on each lobe; the dorsum of each abdominal segment bears a pair of dark D-shaped markings (these are not distinct in some specimens) and a pair of dark tubercles near the posterior margin. The color of the second (less common) form is not variable. The head of this form is rusty brown; the body is rusty brown with a creamy yellow middorsal line, lateral flange and subdorsal markings. The color pattern of the mid-instar larva is unlike that of the mature larva.

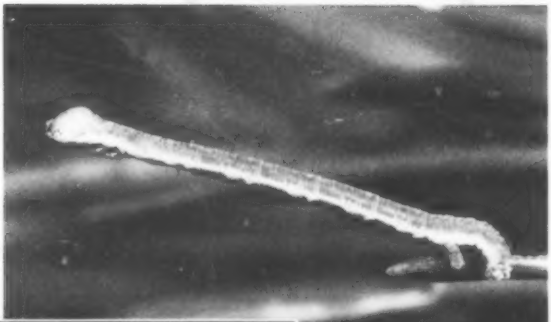
Bionomics: This species overwinters in the pupal stage (interior and some coastal specimens) or possibly adult stage (most coastal specimens). Adults emerge May to June (interior and some coastal specimens). Larvae are present from July to September, and pupation occurs in September or October. Adults of most coastal specimens emerge September to October.

Damage: *Caripeta aequaliaria* is a relatively uncommon solitary defoliator.

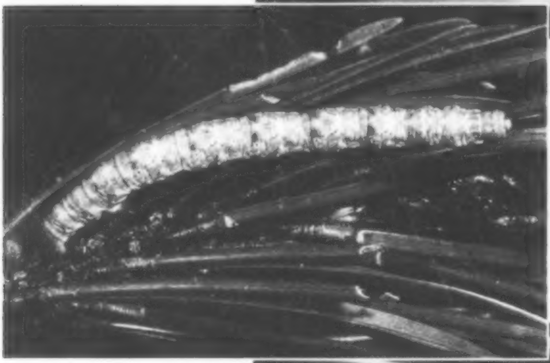
Similar species: *Caripeta angustiorata* (p. 68) and *C. divisata* (p. 70). Although superficially similar, *C. aequaliaria* has a unique and distinctly different color pattern of dashes, lines and geometrical shapes, and is larger.



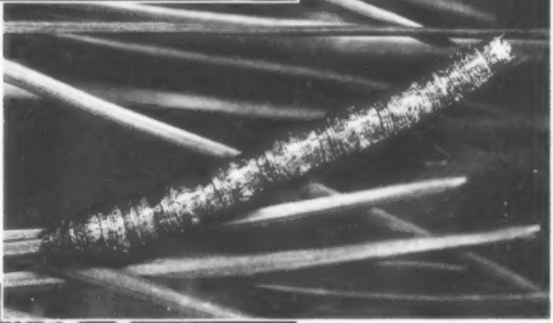
Dorsal view of mature larva (second, less common form) on lodgepole pine



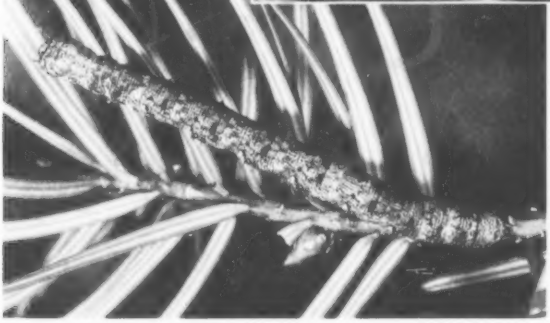
Mid-instar larva on lodgepole pine.



Dorsal view of mature larva (common form, pale grey variant) on lodgepole pine



Dorsal view of mature larva (common form, reddish brown variant) on Douglas-fir



Dorsal view of mature larva (common form, brown variant) on ponderosa pine

Caripeta angustiorata Walker
Grey pine looper

Hosts: Lodgepole pine in British Columbia; also occurs on jack pine and white pine in eastern Canada.

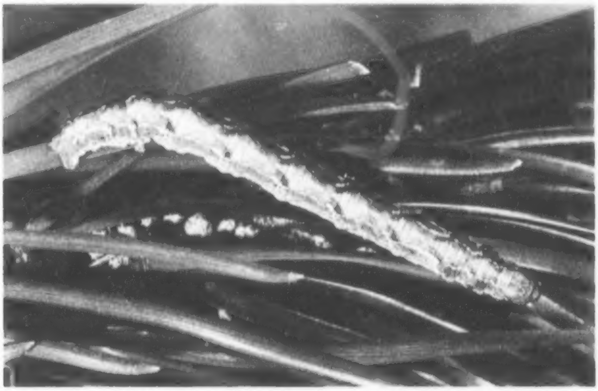
Distribution: Throughout the south and central interior of British Columbia; east to Nova Scotia and south to North Carolina and California.

Description: Mature larva up to 34 mm long. This species has 2 distinct color pattern forms. The color of the more common dark form varies from light rusty brown to dark rusty brown. The head of this form is pale brown to yellowish brown, with dark herringbone markings on each lobe. The body has a broken white to yellowish cream middorsal stripe. Each abdominal segment is marked near the posterior margin with a pair of dark oblique dashes—each bearing a single tubercle. Obscure transverse ridges run between the tubercles. The second, less common, light form is rusty brown with a middorsal yellow diamond pattern. The color pattern of the mid-instar larva is unlike that of the mature larva.

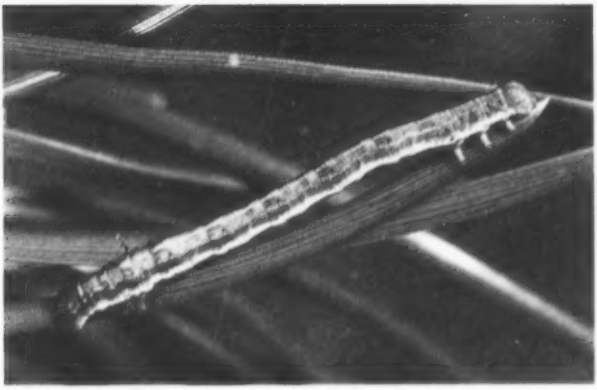
Bionomics: This species overwinters in the pupal stage. Adults emerge from mid-June to early July. Larvae are present late July to mid-October, and pupation occurs in October.

Damage: The grey pine looper is a common solitary defoliator. Localized outbreaks causing noticeable defoliation on lodgepole pine were recorded in Jasper National Park, Alberta in 1949.

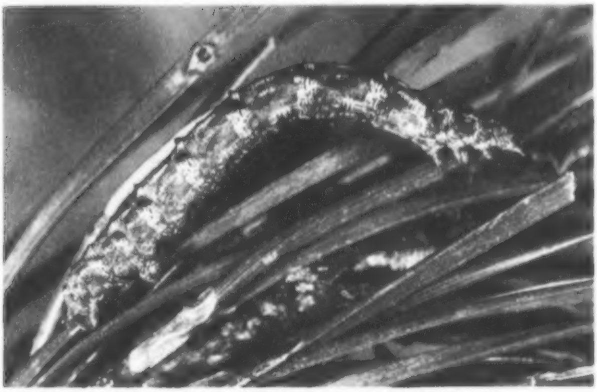
Similar species: *Caripeta aequaliaria* (p. 66) and *C. divisata* (p. 70). Although superficially similar, *C. angustiorata* has a unique and distinctly different color pattern of dashes, lines and geometrical shapes.



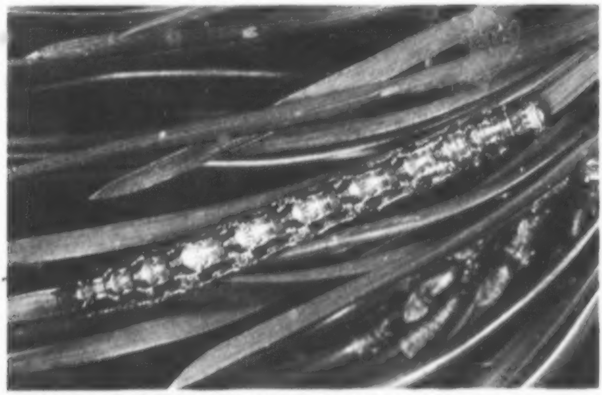
Dorsal view of mature larva (light form) on lodgepole pine



Dorso-lateral view of mid-instar larva on lodgepole pine



Lateral view of mature larva (dark form) on lodgepole pine



Dorsal view of mature larva (dark form) on lodgepole pine

Caripeta divisata Walker
Grey forest looper

Hosts: Principal hosts are western hemlock and Douglas-fir; other hosts include Engelmann spruce, white spruce, Sitka spruce, black spruce, subalpine fir, amabilis fir, grand fir, western redcedar, lodgepole pine, western larch, tamarack and mountain hemlock.

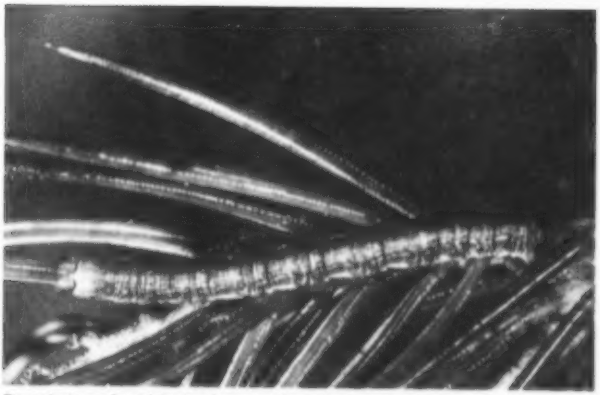
Distribution: Generally distributed throughout British Columbia from the Nass and Peace River drainages south; east to Nova Scotia and Newfoundland, and south to Maryland and Oregon.

Description: Mature larva up to 38 mm long. Color variable: light yellowish brown to dark purple. Head, pale brown with dark herringbone pattern on each lobe. Dorsum, marked with wavy rusty brown to grey lines and a middorsal yellow diamond pattern or broken yellow line. Broad yellow stripe along the lateral flange interrupted by brown patches around each spiracle. Pair of dark tubercles near anterior margin of each abdominal segment. The color pattern of the mid-instar larva is unlike that of the mature larva.

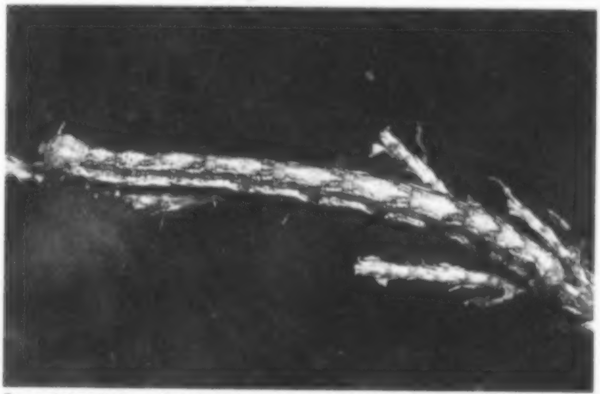
Bionomics: This species overwinters in the pupal stage. Adults emerge from June to July; females lay up to 75 eggs on host foliage. Larvae are present from July to mid-September. Pupation occurs in September.

Damage: The grey forest looper is a common and occasionally destructive solitary defoliator. Outbreaks have been recorded in the Zymoetz valley, east of Terrace, in 1961, and in the Arrow and Slocan Lakes area from 1990 to 1991. In the west Kootenay outbreak, hemlock mortality reached 78 percent in areas that had been defoliated for 2 consecutive years.

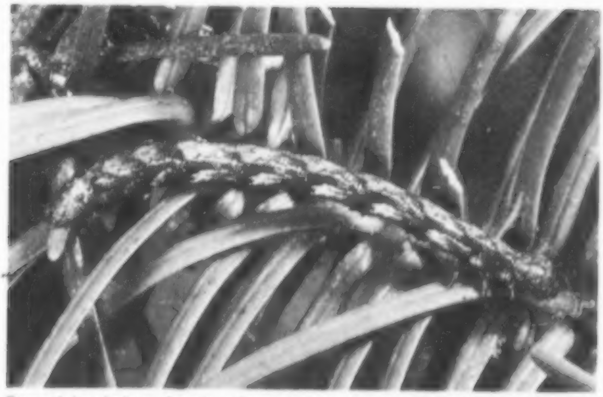
Similar species: *Caripeta aequaliaria* (p. 66) and *C. angustiorata* (p. 68). Although superficially similar, *C. divisata* has its own distinctly different color pattern of dashes, lines and geometrical shapes.



Dorsal view of mid-instar larva on Engelmann spruce



Dorso-lateral view of mature larva on western hemlock



Dorso-lateral view of mature larva (purple form) on Douglas-fir

Cladara limitaria (Walker)
Yellowlined forest looper

Hosts: Principal hosts are western hemlock, Douglas-fir, Engelmann spruce, subalpine fir, and amabilis fir; other hosts include white spruce, Sitka spruce, black spruce, grand fir, mountain hemlock, western redcedar, western larch and tamarack.

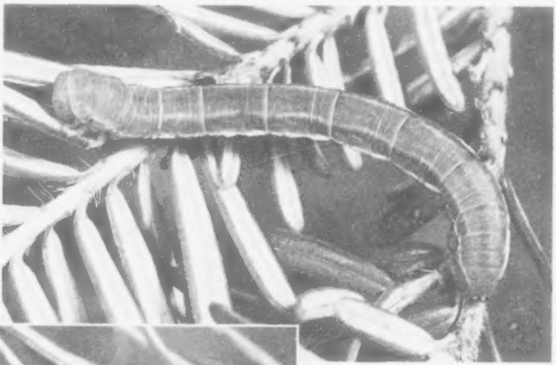
Distribution: Generally distributed throughout British Columbia from the Nass and Peace River drainages south; east to Nova Scotia and Newfoundland, and south to Connecticut and Oregon.

Description: Mature larva up to 24 mm long. Head, unmarked yellowish green. Body, green; dark green middorsal line (often faint); yellow subdorsal line (often faint); yellow subspiracular stripe along lateral flange.

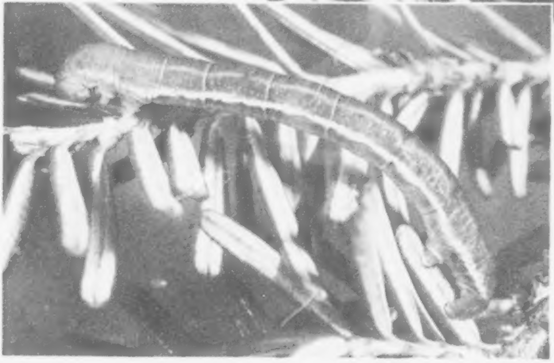
Bionomics: This species overwinters in the pupal stage. Adults emerge in May. Larvae are present from May to July, and pupation occurs in July or August.

Damage: The yellowlined forest looper is a common, solitary defoliator.

Similar species: No similar species occur in British Columbia.



Dorso-lateral view of mature larva on western hemlock



Lateral view of mature larva on western hemlock

Digrammia setonana (McDunnough)

Host: Rocky Mountain juniper.

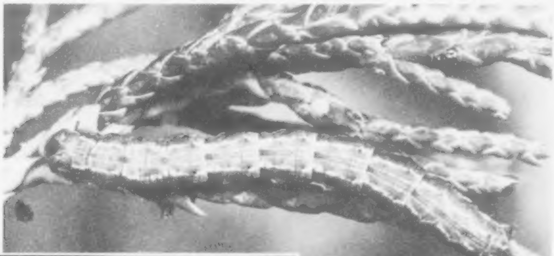
Distribution: Throughout the host range south of 53° latitude in British Columbia; east to mountainous southwestern Alberta, and south to California.

Description: Mature larva up to 27 mm long. Twig mimic. Head, green with small white patch and herringbone pattern on each lobe. Body, green; 2 thin white middorsal lines, white subdorsal stripe of varying width. Lateral triangular white patch immediately anterior to each spiracle.

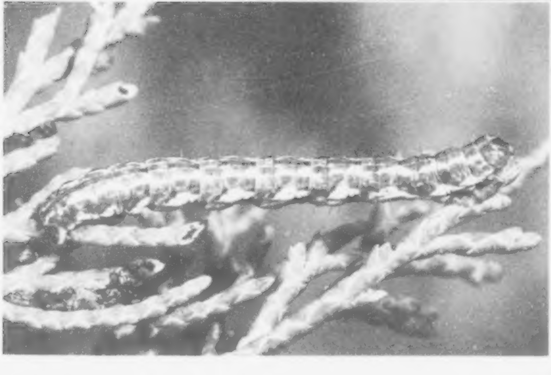
Bionomics: This species usually overwinters in the pupal stage; however, some adults emerge in late summer or fall and may overwinter as adults. Larvae are present from early July to early September. Pupation occurs in August or September. Adults emerge from late August to September or the following June.

Damage: *Digrammia setonana* is a relatively uncommon solitary defoliator.

Similar species: *Digrammia triviata* (p. 74), *Eupithecia niphadophilata* (p. 94), *E. placidata* (p. 100), *E. unicolor* (p. 106) and *Stamnoctenis morrisata* (p. 153) have larvae with complex color patterns that resemble Rocky Mountain juniper twigs. Although superficially similar, *D. setonana* has a unique and distinctly different color pattern of dashes, lines and geometrical shapes.



Dorsal view of mature larva on Rocky Mountain juniper



Dorso-lateral view of mature larva on Rocky Mountain juniper

Digrammia triviata (Barnes & McDunnough)

Host: Rocky Mountain juniper.

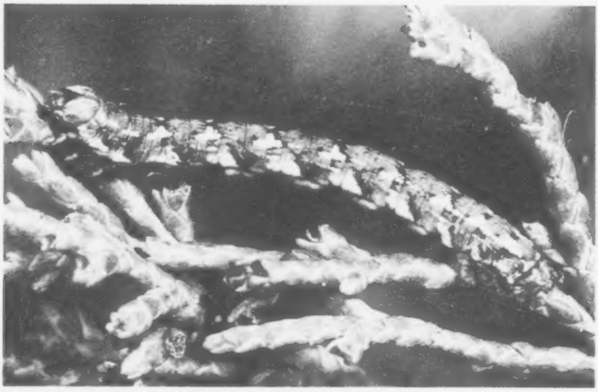
Distribution: Throughout the host range in the interior of British Columbia south of 53° latitude; south to Arizona.

Description: Mature larva up to 27 mm long. Twig mimic. This species has three distinct color forms. The more common brown form closely mimics brown sections of twigs. Similarly, the less common grey and green forms closely mimic grey or green sections of twigs. Head, brown to grey, with a herringbone pattern and white line over each lobe; frontal triangle, grey to black. All 3 color forms have a white bracket-like rectangular pattern on the dorsum and white to greenish white lateral triangular patches.

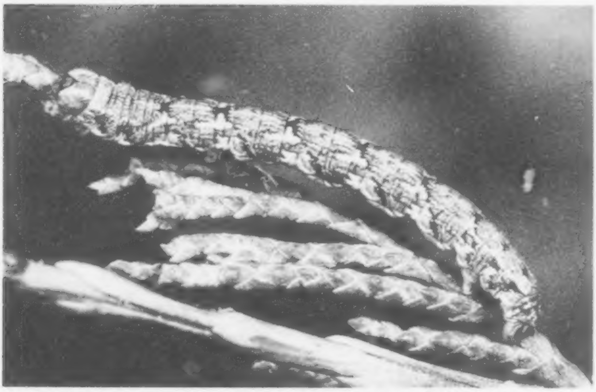
Bionomics: This species usually overwinters in the pupal stage; however, some adults emerge in late summer or fall, and may overwinter as adults. Larvae are present from early July to early September. Pupation occurs in August or September. Adults emerge from late August to September or the following June.

Damage: *Digrammia triviata* is a relatively uncommon solitary defoliator.

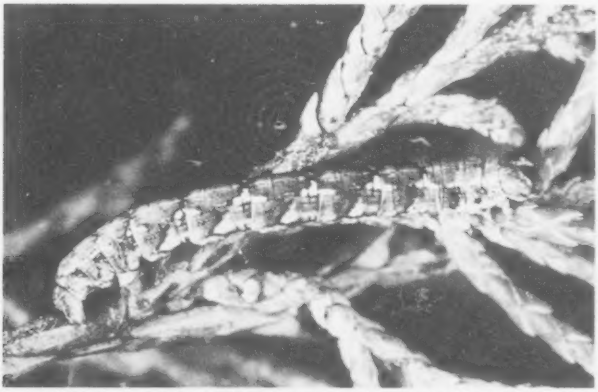
Similar species: *Digrammia setonana* (p. 73), *Eupithecia niphadophilata* (p. 94), *E. placidata* (p. 100), *E. unicolor* (p. 106) and *Stamnoctenis morrisata* (p. 153) all have larvae with complex color patterns that resemble Rocky Mountain juniper twigs. Although superficially similar, *D. triviata* can be distinguished by its unique color pattern of dashes, lines and geometrical shapes.



Dorso-lateral view of mature larva (brown form) on Rocky Mountain juniper



Dorso-lateral view of mature larva (grey form) on Rocky Mountain juniper



Dorso-lateral view of mature larva (green form) on Rocky Mountain juniper

Ectropis crepuscularia (Denis & Schiffermüller) Saddleback looper

Hosts: Principal host is western hemlock; other coniferous hosts include Douglas-fir, western redcedar, subalpine fir, amabilis fir, Engelmann spruce, white spruce, Sitka spruce, tamarack and western larch. Nonconiferous hosts include willow, alder, birch and numerous shrubs.

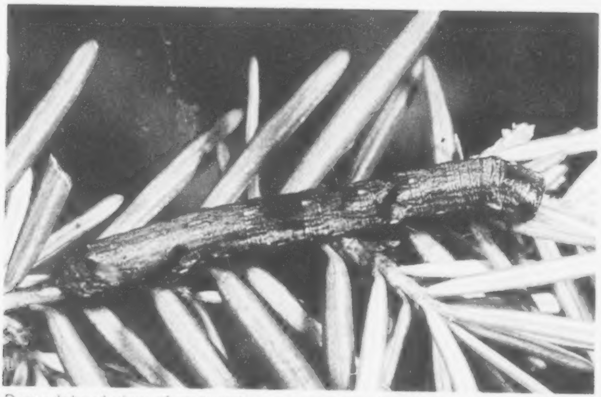
Distribution: Holarctic. Generally distributed throughout British Columbia; east to Nova Scotia and Newfoundland, south to Florida and California; Eurasia.

Description: Mature larva up to 35 mm long. Head, pale brown to pale grey, with rust to grey markings. Body, yellowish brown to grey; dorsum of second thoracic segment, slightly raised. Pair of faint grey middorsal lines. Subdorsal lines intermittently dark then faint. Prominent dark chevron on dorsum of second abdominal segment, and dark U-shaped marking on dorsum of eighth abdominal segment.

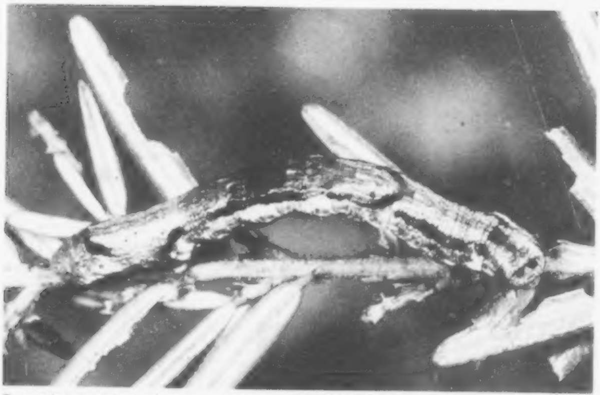
Bionomics: This species overwinters as a pupa buried in the duff. Adults emerge in May, mate and lay eggs in groups of 10 to 20 in bark crevices and under moss on tree boles. Larvae are present from June to August, and pupation occurs in August or September.

Damage: The saddleback looper is a common and occasionally destructive solitary defoliator. Localized outbreaks occurred near Blue River from 1951 to 1953, and near Kitimat from 1960 to 1961, and again in 1969. Extensive tree mortality was recorded after the 1960 to 1961 infestation.

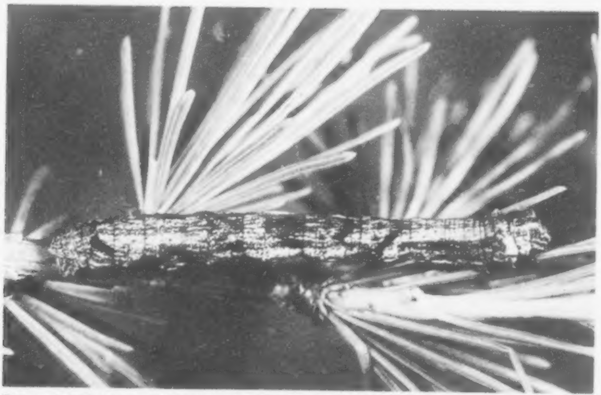
Similar species: No similar species occur in British Columbia.



Dorso-lateral view of mature larva on western hemlock



Dorso-lateral view of mature larva (cream-colored form) on western hemlock



Dorso-lateral view of mature larva (grey form) on tamarack

Enypia griseata Grossbeck

Host: Douglas-fir.

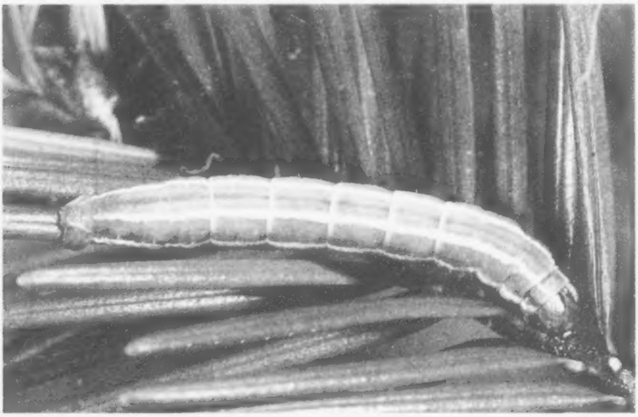
Distribution: Throughout the host range in the interior of British Columbia; east to mountainous southwestern Alberta, and south to California and Arizona.

Description: Mature larva up to 25 mm long. Head, brown with white stripe and dark herringbone pattern on each lobe; frontal triangle, green. Body, pale green; thin dark green middorsal stripe; white subdorsal stripe extending onto head; yellowish white spiracular stripe.

Bionomics: This species overwinters as a fourth-instar larva. Feeding resumes in spring, and continues until late June or early July. The pupal stage lasts 12 to 24 days, and occurs in June or July. Adults emerge from July to August. Females lay about 75 eggs on foliage during August. Larvae emerge about 2 weeks later, and feed until the onset of cold weather.

Damage: *Enypia griseata* is a common, innocuous, solitary defoliator.

Similar species: *Enypia packardata* (p. 79) is very similar, but is restricted to coastal British Columbia.



Dorso-lateral view of mature larva on Douglas-fir

Enypia packardata Taylor

Hosts: Principal hosts are Douglas-fir and western hemlock; other hosts include amabilis fir, grand fir, Sitka spruce and mountain hemlock.

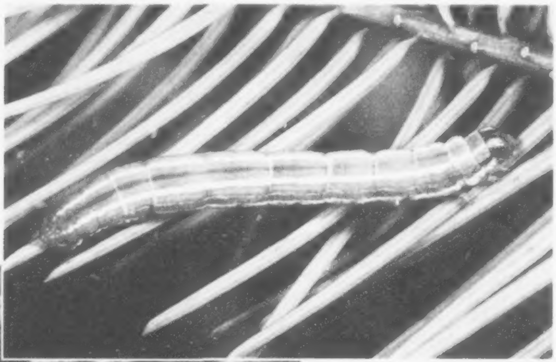
Distribution: Generally distributed throughout coastal British Columbia; north to southeast Alaska, and south to California.

Description: Mature larva up to 25 mm long. Head, brown with a white stripe and dark herringbone pattern on each lobe; frontal triangle, green. Body, bright green; thin dark green middorsal stripe; white subdorsal stripe extending onto head; white spiracular stripe.

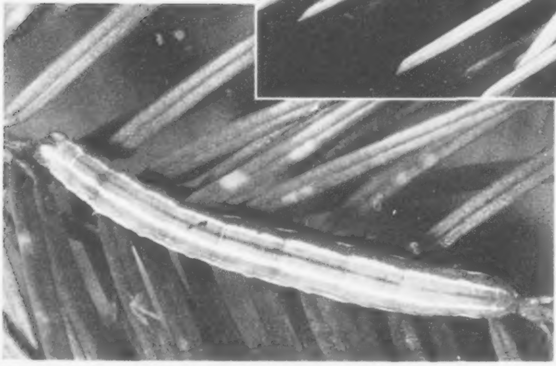
Bionomics: This species overwinters as a fourth-instar larva. Larval feeding resumes in the spring and continues until May or June. The pupal stage lasts about 21 days, and occurs in June or July. Adults emerge from June to August. Females lay about 55 eggs on foliage. Larvae emerge about 2 weeks later, and feed until the onset of cold weather.

Damage: *Enypia packardata* is a common, innocuous, solitary defoliator.

Similar species: *Enypia griseata* (p. 78) is very similar, but is restricted to interior regions of British Columbia.



Dorsó-lateral view of mature larva on Douglas-fir



Dorsal view of mature larva on Douglas-fir

Enypia venata (Grote)

Hosts: Principal hosts are western hemlock, Douglas-fir and amabilis fir; other hosts include western redcedar, Sitka spruce, western white pine, grand fir, subalpine fir, mountain hemlock, white spruce and Engelmann spruce.

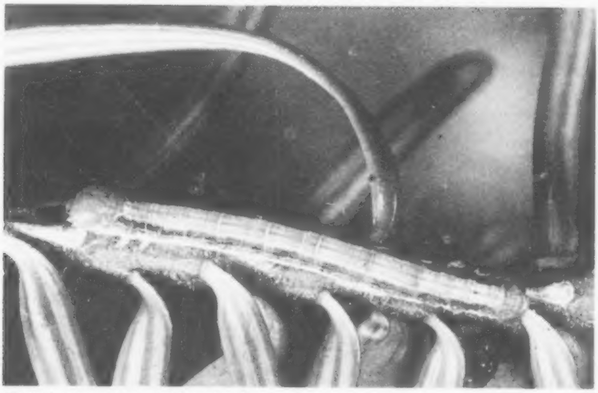
Distribution: Generally distributed throughout British Columbia from the Nass and upper Fraser River drainages south; east to mountainous western Alberta, north to southeast Alaska, and south to California and New Mexico.

Description: Mature larva up to 32 mm long. Head, light brown with a rusty brown herringbone pattern on each lobe. Body, rusty brown; dorsum, creamy yellow with middorsal black markings. Creamy yellow to white spiracular stripe, bordered above by a dark broken line.

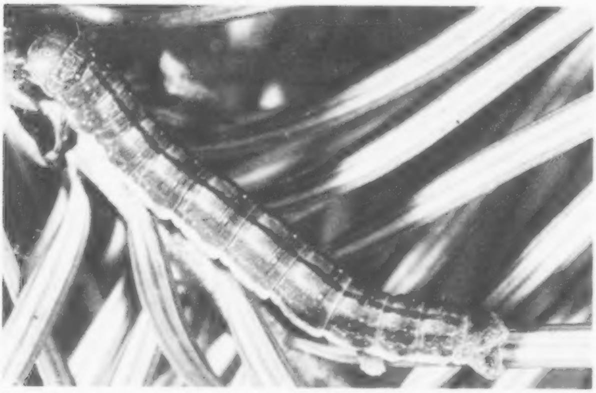
Bionomics: This species overwinters as a fourth- or fifth-instar larva. Feeding resumes in the spring and continues until June. Pupation occurs in June or July; adults emerge 16 to 38 days later, mate and lay eggs. Larvae emerge soon after and feed until the onset of cold weather.

Damage: *Enypia venata* is a common, innocuous, solitary defoliator.

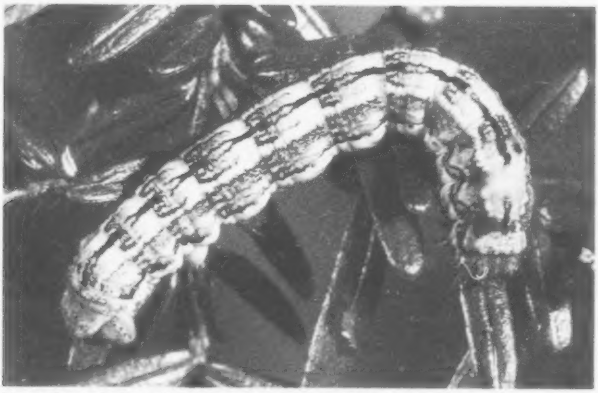
Similar species: No similar species occur in British Columbia.



Early instar larva on Douglas-fir



Penultimate-instar larva (overwintering stage) on Douglas-fir



Dorso-lateral view of mature larva on western hemlock

Epirrita autumnata (Borkhausen)

Green velvet looper

Hosts: Principal hosts are western hemlock, Engelmann spruce, white spruce, subalpine fir, amabilis fir, grand fir and Douglas-fir; other hosts include western larch, Sitka spruce, western redcedar and mountain hemlock. Nonconiferous hosts include alder, willow, birch and poplar.

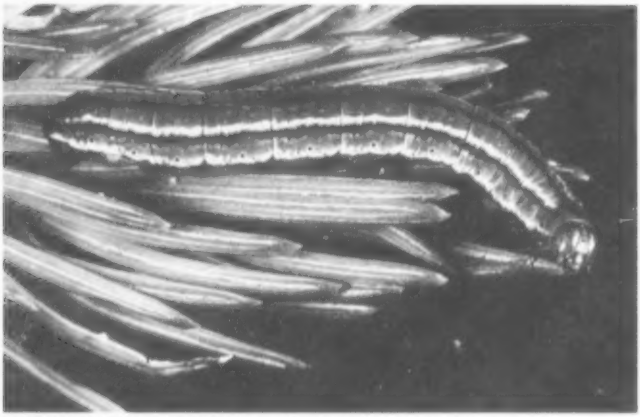
Distribution: Holarctic. Generally distributed throughout British Columbia from the Nass and upper Fraser River drainages south; east to Nova Scotia, and south to California; Eurasia.

Description: Mature larva up to 23 mm long. This species has 2 distinct color pattern forms. The head of both forms is unmarked green. The body of the more common form is green with a dark green middorsal stripe, a light yellow subdorsal stripe and a creamy white subspiracular stripe. The second, less common, form is yellowish green with a creamy white subspiracular stripe.

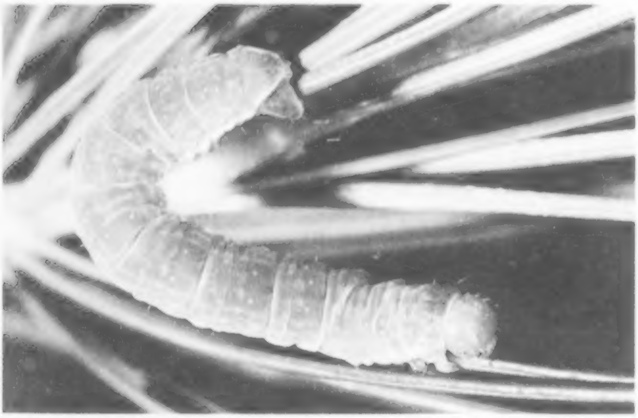
Bionomics: This species overwinters in the egg stage. Larvae are present from May to July. Pupation occurs in June or July, and adults emerge from July to September.

Damage: The green velvet looper is a common and, on occasion, locally abundant, nondestructive, solitary defoliator.

Similar species: No similar species occur in British Columbia.



Dorso-lateral view of mature larva (common form) on white spruce



Dorso-lateral view of mature larva (less common form) on western larch

Epirrita pulchraria (Taylor)
Whitelined looper

Hosts: Principal hosts are western hemlock and Sitka spruce; other hosts include amabilis fir, subalpine fir, Engelmann spruce, white spruce, Douglas-fir, mountain hemlock and western larch.

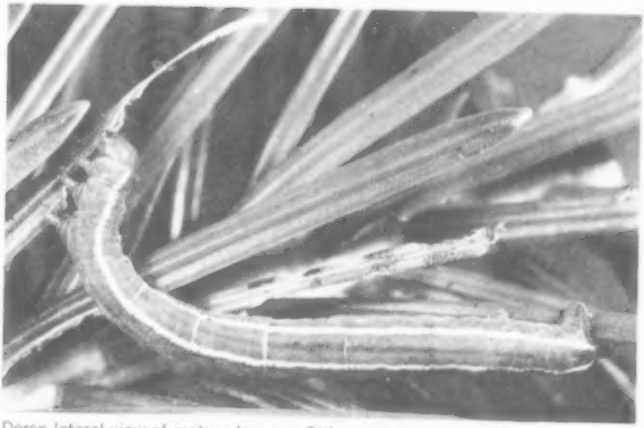
Distribution: Generally distributed throughout coastal British Columbia and rarely in the interior; south to California.

Description: Mature larva up to 21 mm long. Head, unmarked green. Body, lime green; faint dark green middorsal pinstripe; white subdorsal stripe.

Bionomics: This species appears to overwinter in the egg stage. Larvae are present from June to mid-August. Pupation occurs in August, and adults emerge October to December.

Damage: The whitelined looper is a relatively uncommon, solitary defoliator.

Similar species: No similar species occur in British Columbia.



Dorso-lateral view of mature larva on Sitka spruce

Eulithis destinata (Möschler)

Hosts: Principal coniferous host is subalpine fir; nonconiferous hosts include willow and alder.

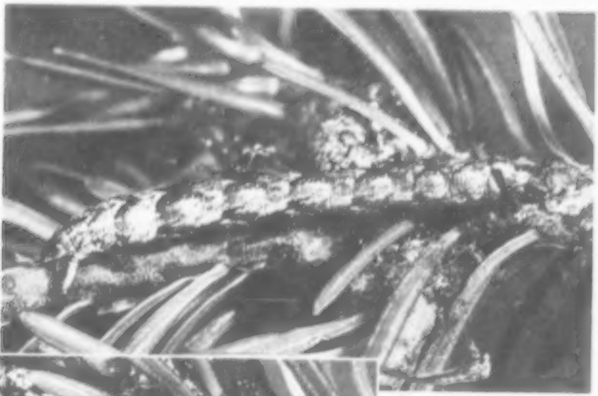
Distribution: Throughout the central and southern interior of British Columbia; east to New Brunswick, and south to California.

Description: Mature larva up to 25 mm long. Head, light grey with dark markings. Body, grey with middorsal light grey diamond pattern; second thoracic segment, swollen dorsally.

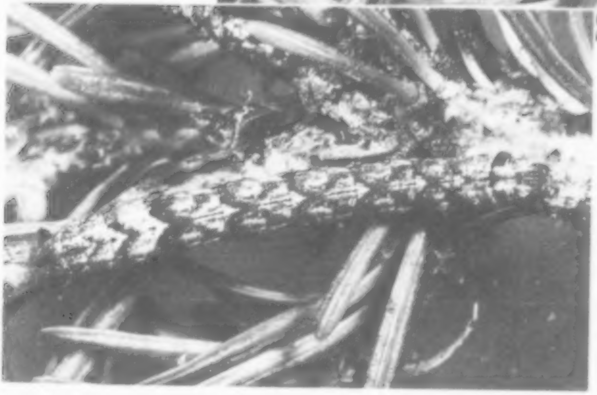
Bionomics: This species appears to overwinter in the egg stage. Larvae are present from late May to July. Pupation occurs in July or August, and adults emerge in August.

Damage: *Eulithis destinata* is a relatively uncommon, solitary defoliator.

Similar species: No similar species occur in British Columbia.



Dorso-lateral view of mature larva on subalpine fir



Dorsal view of mature larva on subalpine fir

Eupithecia annulata (Hulst)

Hosts: Principal hosts are Engelmann spruce, white spruce, Douglas-fir and western hemlock; other hosts include grand fir, amabilis fir, subalpine fir, Sitka spruce and mountain hemlock.

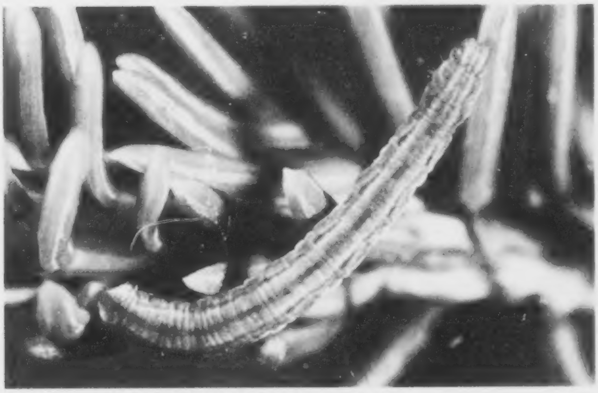
Distribution: Generally distributed throughout British Columbia; north to the Yukon, east to Newfoundland and Labrador, and south to California and Colorado.

Description: Mature larva up to 22 mm long. Head, yellowish brown with dark mottle. Body, yellowish brown to rusty brown, with dark middorsal arrowhead pattern or, less commonly, stripe. Dark wedge-shaped subdorsal markings. Irregular yellow stripe along the lateral flange.

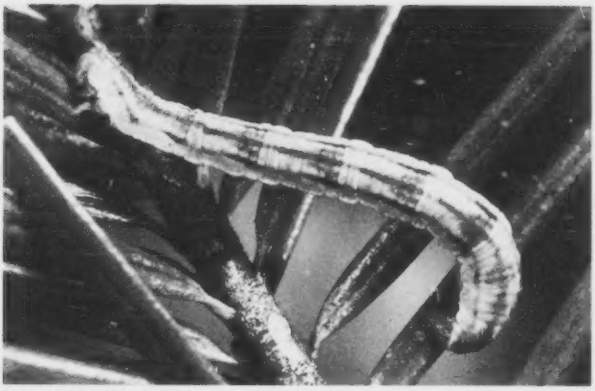
Bionomics: This species overwinters in the pupal stage. Adults emerge from April to June. Larvae are present from May to August, and pupation occurs in July or August.

Damage: *Eupithecia annulata* is a common, innocuous, solitary defoliator.

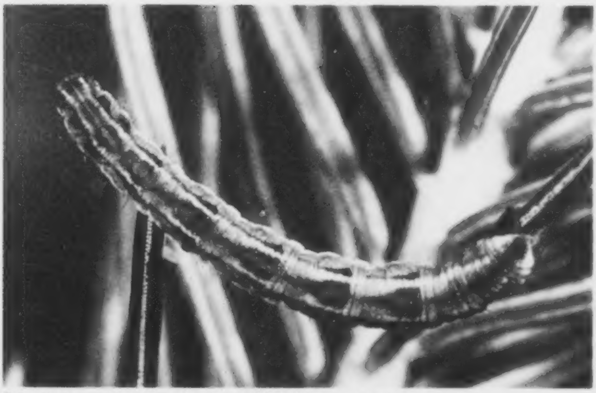
Similar species: *Eupithecia annulata* and *E. olivacea* (p. 96) are similar and difficult to distinguish from each other. Larvae collected on Douglas-fir (the only shared host) that appear to be either of these species should be reared to the adult stage. Genitalic preparations may be necessary to confirm identification.



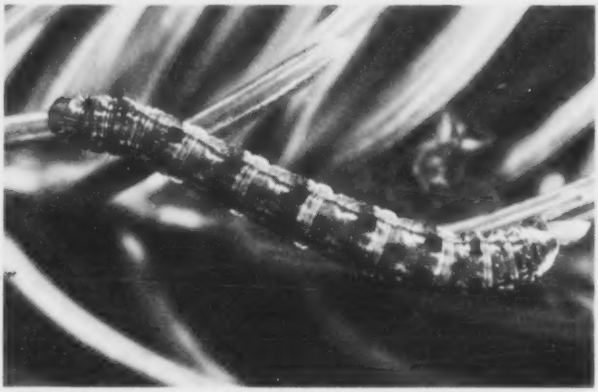
Dorsal view of mature larva on Engelmann spruce



Dorsal view of mature larva on Douglas-fir.



Dorsal view of mature larva on Engelmann spruce



Dorsal view of mature larva on white spruce

Eupithecia harrisonata

Hosts: Principal host is western hemlock; other hosts include Douglas-fir, mountain hemlock and grand fir.

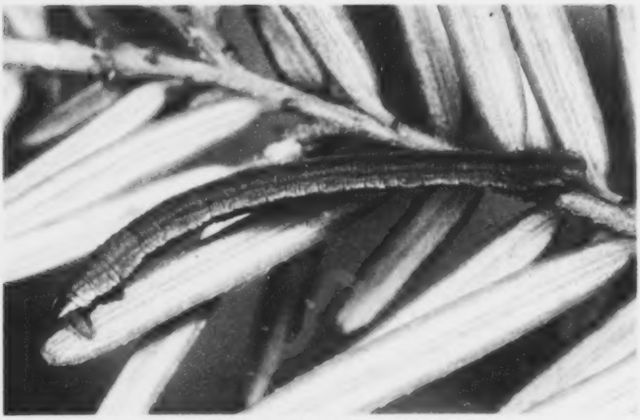
Distribution: Coastal British Columbia; south to California.

Description: Mature larva up to 20 mm long. Head, unmarked brown. Body, yellowish brown to reddish brown, with a dark middorsal line and a yellow lateral flange.

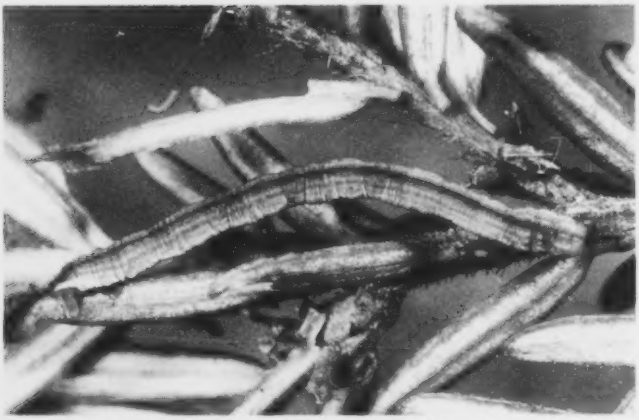
Bionomics: This species overwinters in the pupal stage. Adults emerge in May and lay eggs on host foliage. Larvae are present from July to September. Pupation occurs in September.

Damage: *Eupithecia harrisonata* is a common, innocuous, solitary defoliator.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of mature larva on western hemlock



Dorso-lateral view of mature larva on western hemlock

Eupithecia interruptofasciata Packard

Host: Common juniper.

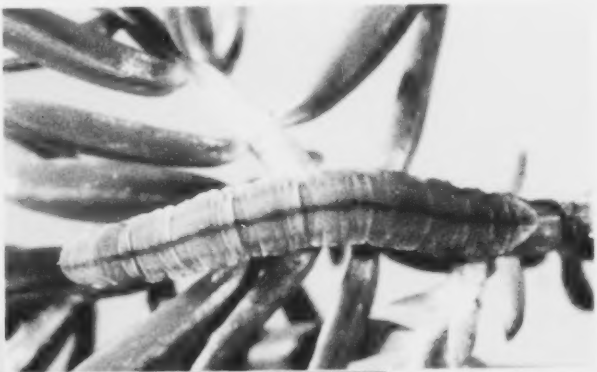
Distribution: Throughout the host range in the interior of British Columbia; north to the Yukon, east to Newfoundland, and south to Massachusetts and California.

Description: Mature larva up to 16 mm long. This species has 2 distinct color pattern forms. The more common green form has a green head and body, a black middorsal stripe and a cream-colored spiracular stripe. The brown form has a light tan head with dark markings; the body is rusty brown above, with a black middorsal stripe, a cream-colored spiracular stripe and a chocolate-colored ventral area.

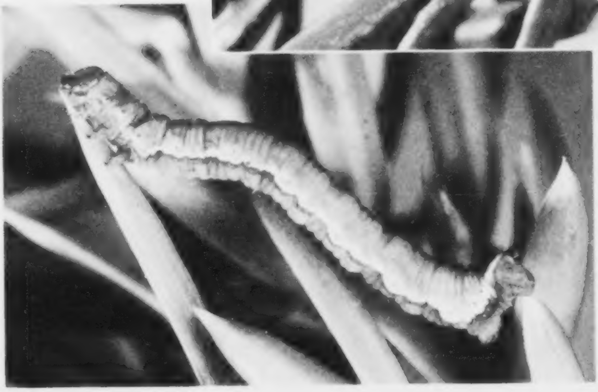
Bionomics: This species overwinters in the egg stage. Larvae are present from mid-May to early August. Pupation occurs in July or August, and adults emerge from late July to October.

Damage: *Eupithecia interruptofasciata* is a relatively uncommon, solitary defoliator.

Similar species: No similar species occur on common juniper in British Columbia.



Dorsal view of mature larva (green form) on common juniper



Dorso-lateral view of mature larva (brown form) on common juniper

Eupithecia lariciata (Freyer)

Larch pug

Hosts: Principal hosts are Douglas-fir, Engelmann spruce, white spruce, subalpine fir and western larch; other hosts include tamarack and black spruce.

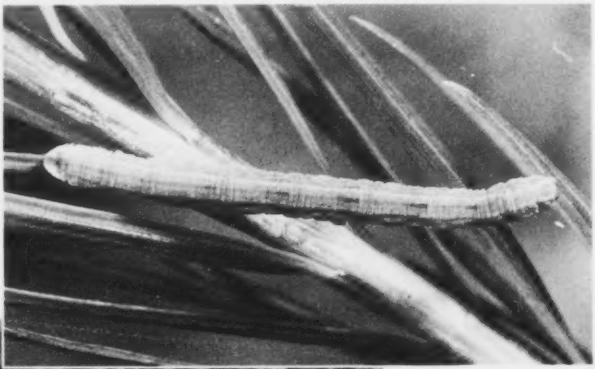
Distribution: Holarctic. Generally distributed throughout British Columbia; east to Newfoundland, and south to Colorado and Oregon; Eurasia.

Description: Mature larva up to 22 mm long. Head, light yellowish brown with brown markings. Body, light brown with an intermittently dark then faint middorsal line. Faint light yellow subdorsal stripe. Irregular yellow stripe along the lateral flange.

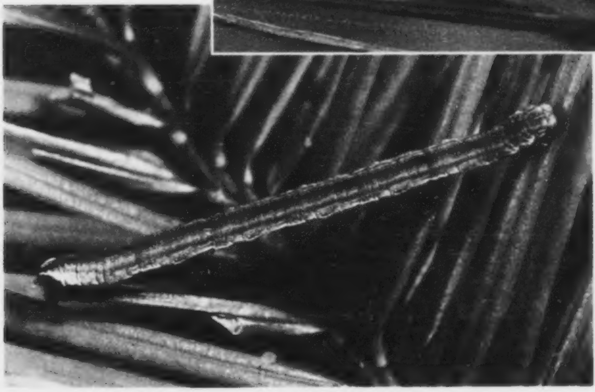
Bionomics: This species overwinters as a pupa in litter or soil. Adults emerge in May and lay eggs on needles. Larvae are present from mid-June to early August; pupation occurs in July or August.

Damage: The larch pug is a common, innocuous, solitary defoliator.

Similar species: No similar species occur in British Columbia.



Dorsal view of mature larva on western larch



Dorso-lateral view of mature larva on Douglas-fir

Eupithecia longipalpata Packard

Hosts: Principal hosts are Douglas-fir and western hemlock; other hosts include mountain hemlock and grand fir.

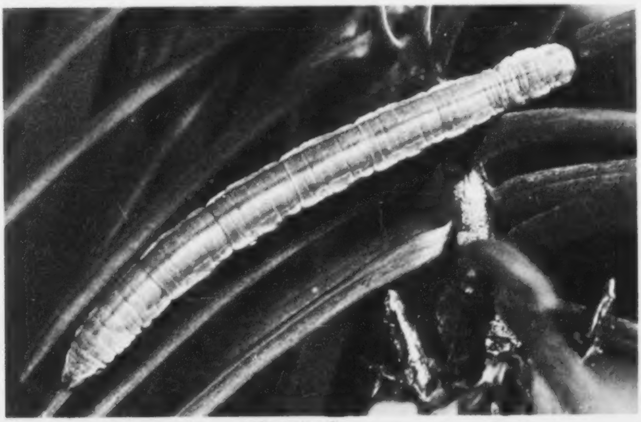
Distribution: Throughout coastal British Columbia; south to California.

Description: Mature larva up to 20 mm long. Head, yellowish green, unmarked. Body, green with a dark green middorsal line and a creamy yellow lateral flange.

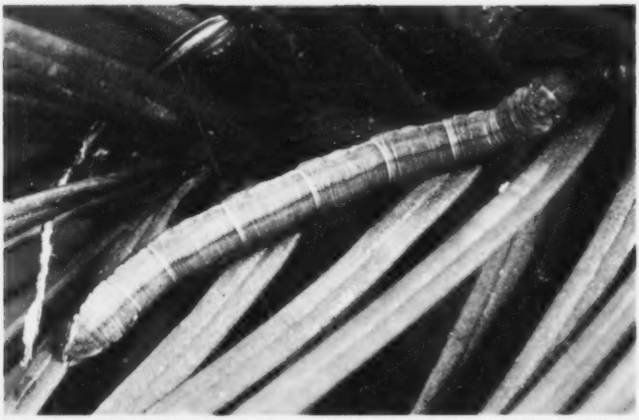
Bionomics: This species overwinters as a mid- to late-instar larva. Larval feeding resumes in April and continues until early June. Pupation occurs in early June. Adults emerge in late June to July and lay eggs. Larvae emerge soon after and feed until the onset of cold weather.

Damage: *Eupithecia longipalpata* is a common, innocuous, solitary defoliator.

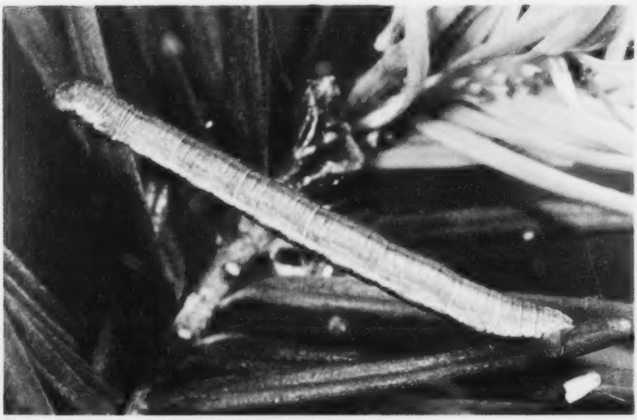
Similar species: No similar species occur in British Columbia.



Dorsal view of mature larva on Douglas-fir



Dorsal view of penultimate-instar larva (overwintering stage) on Douglas-fir



Dorso-lateral view of mature larva on Douglas-fir

Eupithecia niphadophilata (Dyar)

Host: Rocky Mountain juniper.

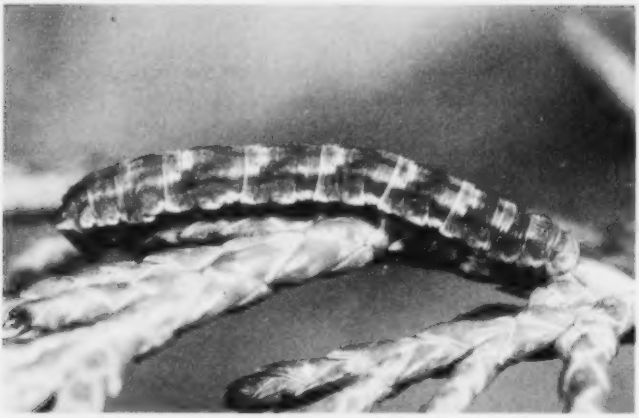
Distribution: Throughout the host range in British Columbia south of 54° latitude; east to mountainous western Alberta, and south to New Mexico.

Description: Mature larva up to 20 mm long. This species has 2 distinct color forms. The more common green form has a greenish yellow head. The body is yellowish green with a dark green middorsal stripe. Dorsum, marked with alternating yellow and dark green chevron-like markings. The brown form has similar markings.

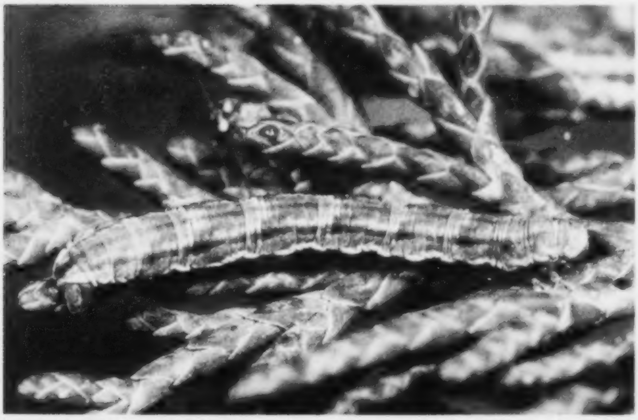
Bionomics: This species appears to overwinter in the egg stage. Larvae are present from mid-May to early August. Pupation occurs in July or August, and adults emerge from late July to September.

Damage: *Eupithecia niphadophilata* is a relatively uncommon, solitary defoliator.

Similar species: *Digrammia setonana* (p. 73), *D. triviata* (p. 74), *E. placidata* (p. 100), *E. unicolor* (p. 106) and *Stamnoctenis morrisata* (p. 153) resemble *E. niphadophilata*. All have larvae with complex color patterns that resemble Rocky Mountain juniper twigs. Although superficially similar, *E. niphadophilata* has a unique and distinctly different color pattern of dashes, lines and geometrical shapes.



Dorso-lateral view of mature larva (green form) on Rocky Mountain juniper



Dorso-lateral view of mature larva (brown form) on Rocky Mountain juniper

Eupithecia olivacea Taylor

Host: Douglas-fir.

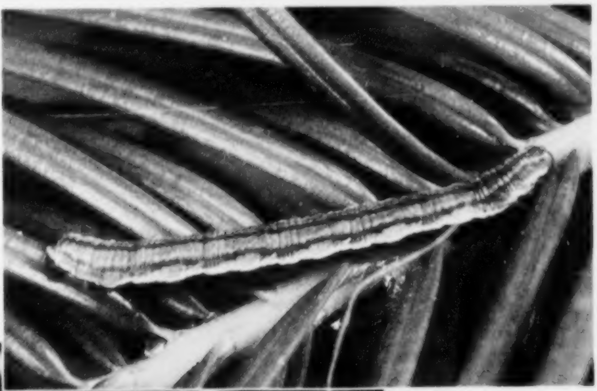
Distribution: Throughout the host range on the south coast and southwest interior of British Columbia; south to California.

Description: Mature larva up to 20 mm long. Head, brown unmarked. Body, brown with dark brown middorsal stripe; creamy yellow lateral flange.

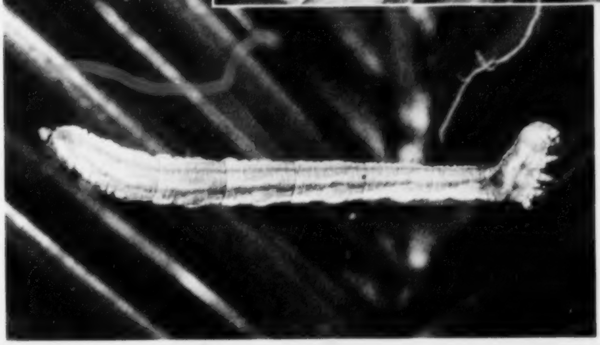
Bionomics: This species overwinters in the pupal stage. Adults emerge from early March to April. Larvae are present April to June, and pupation occurs in late June or July.

Damage: *Eupithecia olivacea* is a common, innocuous, solitary defoliator.

Similar species: *Eupithecia olivacea* and *E. annulata* (p. 86) are similar and difficult to distinguish. Larvae collected on Douglas-fir (the only shared host) that appear to be either species should be reared to the adult stage to confirm identification.



Dorso-lateral view of mature larva on Douglas-fir



Dorso-lateral view of mature larva on Douglas-fir

Eupithecia ornata (Hulst)

Hosts: Principal host is lodgepole pine; other hosts include western white pine and ponderosa pine.

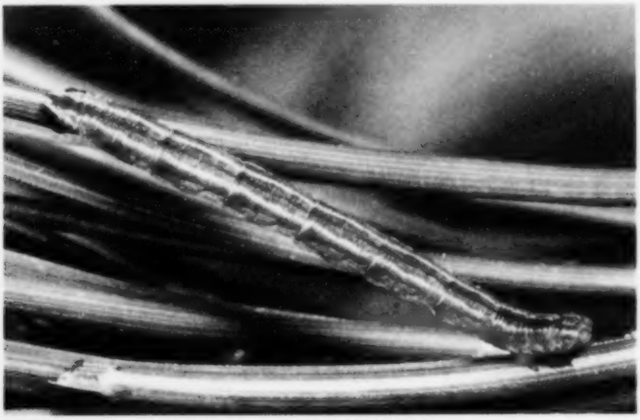
Distribution: Throughout the host range in British Columbia south of 54° latitude; east to mountainous western Alberta, and south to California and Colorado.

Description: Mature larva up to 22 mm long. Head, brown unmarked. Body, elongate and green, with a striking yellow-margined middorsal red stripe. Posterior abdominal prolegs, red.

Bionomics: This species overwinters in the pupal stage. Adults emerge June to July. Larvae are present July to September, and pupation occurs in August or September.

Damage: *Eupithecia ornata* is a relatively uncommon, solitary defoliator.

Similar species: *Eupithecia pseudotsugata* (p. 102) is similar, but occurs on a different host.



Dorso-lateral view of mature larva on lodgepole pine

Eupithecia palpata Packard

Hosts: Principal hosts are lodgepole pine and Douglas-fir; other hosts include Engelmann spruce, white spruce, western hemlock, subalpine fir, amabilis fir, grand fir and ponderosa pine.

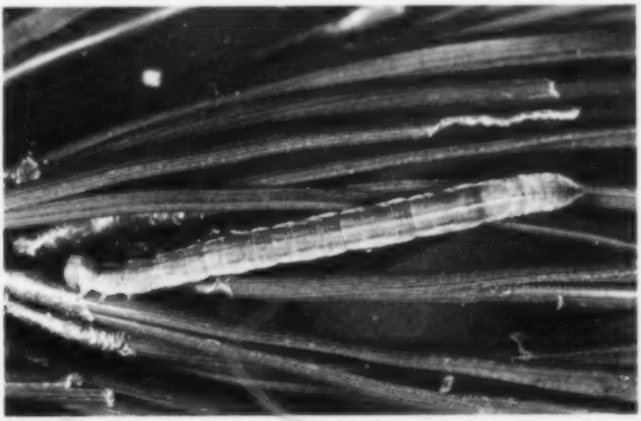
Distribution: Generally distributed throughout British Columbia; east to Newfoundland, and south to North Carolina and Washington.

Description: Mature larva up to 20 mm long. Head, unmarked reddish orange. Body, elongate; dorsum, rusty brown with dark middorsal stripe; yellow lateral flange.

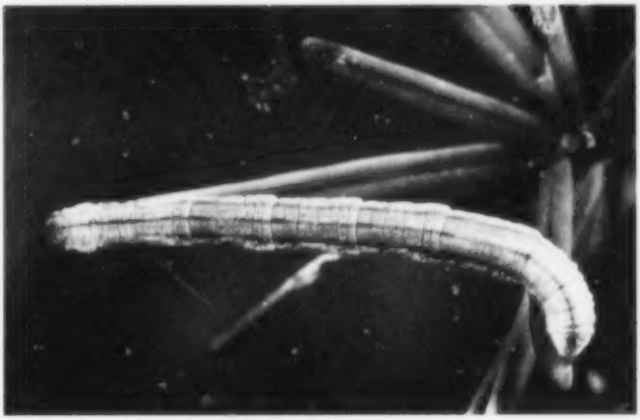
Bionomics: This species overwinters in the pupal stage. Adults emerge from June to late July. Larvae are present from June to late September, and pupation occurs in September or October.

Damage: *Eupithecia palpata* is a relatively uncommon, solitary defoliator.

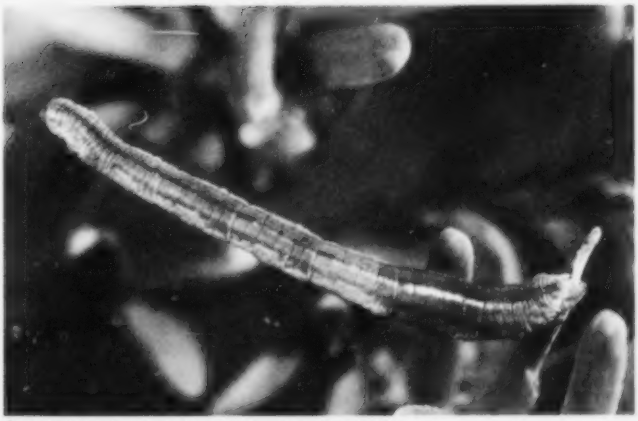
Similar species: No similar species occur in British Columbia.



Dorsal view of mature larva on lodgepole pine



Dorsal view of mature larva on western hemlock



Dorsal view of mature larva on western hemlock

Eupithecia placidata Taylor

Hosts: Principal host is Rocky Mountain juniper; also recorded from western redcedar.

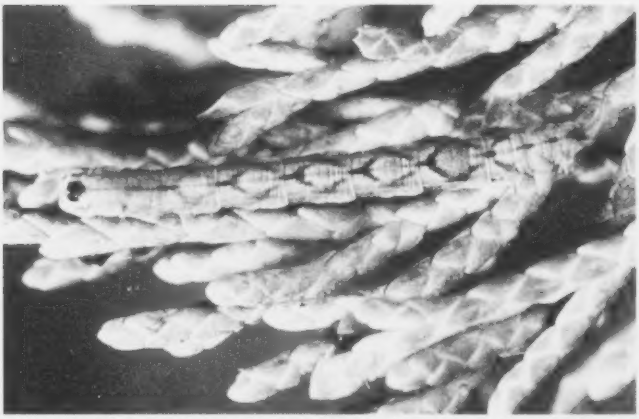
Distribution: Throughout the interior host range north to Williams Lake; south to California.

Description: Mature larva up to 20 mm long. Twig mimic. Head, greenish brown with dark markings. Body, rusty brown to green; dorsum, marked with dark wishbone pattern and faint dark middorsal pinstripe.

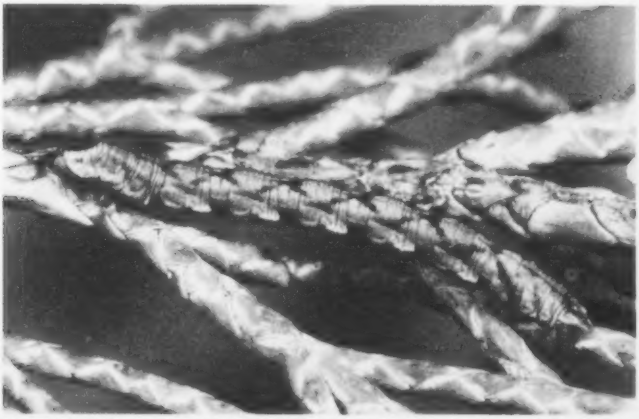
Bionomics: This species principally overwinters in the pupal stage. However, some adults emerge in fall and may overwinter as adults. Larvae are present from mid-July to September; pupation occurs in September.

Damage: *Eupithecia placidata* is a relatively uncommon, solitary defoliator.

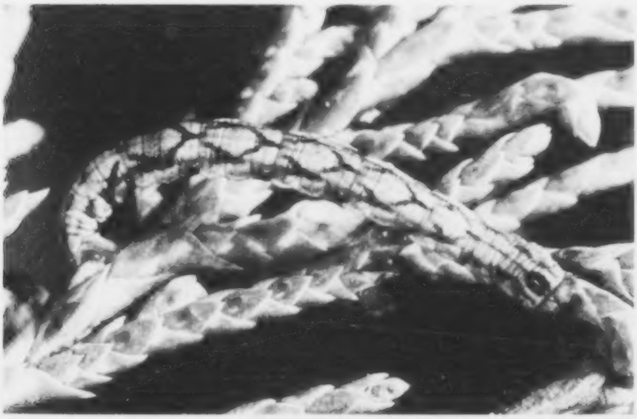
Similar species: *Digrammia setonana* (p. 73), *D. triviata* (p. 74), *E. niphadophilata* (p. 94), *E. unicolor* (p. 106) and *Stamnoctenis morrisata* (p. 153) resemble *E. placidata*. All have larvae with complex color patterns that resemble Rocky Mountain juniper twigs. Although superficially similar, *E. placidata* has its own distinct color pattern of dashes, lines and geometrical shapes.



Dorsal view of mature larva (green form) on Rocky Mountain juniper



Dorso-lateral view of mature larva (brown form) on Rocky Mountain juniper



Dorso-lateral view of mature larva (brownish green form) on Rocky Mountain juniper

Eupithecia pseudotsugata MacKay

Host: Douglas-fir.

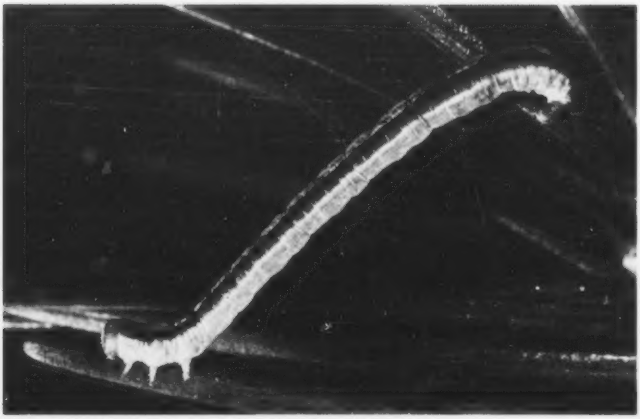
Distribution: Throughout the host range in British Columbia; east to mountainous western Alberta.

Description: Mature larva up to 20 mm long. Head, brown unmarked. Body, elongate and green, with a striking yellow-margined middorsal red stripe. Posterior abdominal prolegs, red.

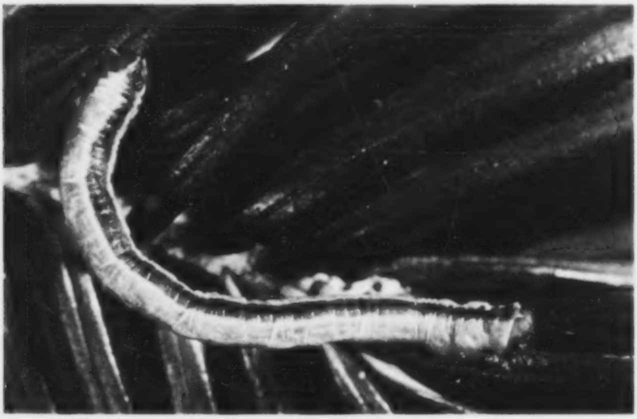
Bionomics: This species overwinters in the pupal stage. Adults emerge June to July. Larvae are present from July to September, and pupation occurs in September.

Damage: *Eupithecia pseudotsugata* is a relatively uncommon, solitary defoliator.

Similar species: *Eupithecia ornata* (p. 97) is similar, but occurs on different hosts.



Dorso-lateral view of mature larva on Douglas-fir



Dorso-lateral view of mature larva on Douglas-fir

Eupithecia subfuscata (Haworth)

Grey pug

Hosts: Coniferous hosts include Douglas-fir, Sitka spruce and lodgepole pine; hardwood hosts include willow, alder, birch, poplar and Garry oak.

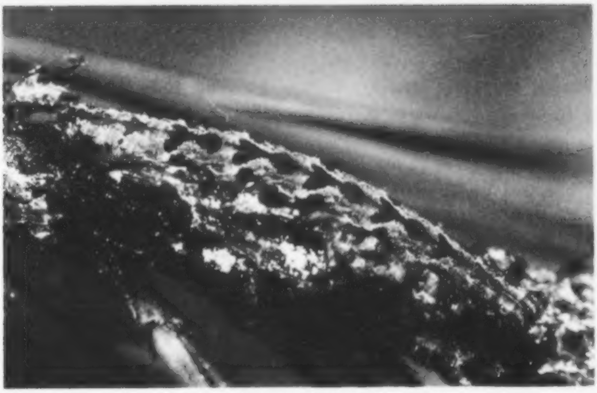
Distribution: Holarctic. Throughout British Columbia south of 56° latitude; east to Newfoundland, south to New Mexico; Eurasia.

Description: Mature larva up to 16 mm long. Body color, highly variable: from light brown to dark brown; dorsum, with dark brown wish-bone pattern. Body, covered with very small greyish white pinacula.

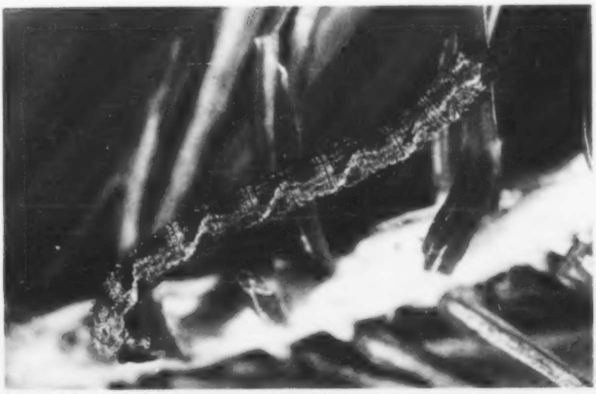
Bionomics: This species overwinters in the pupal stage. Adults emerge from May to July. Larvae are present from late June to September, and pupation occurs in September.

Damage: The grey pug is a relatively uncommon, solitary defoliator.

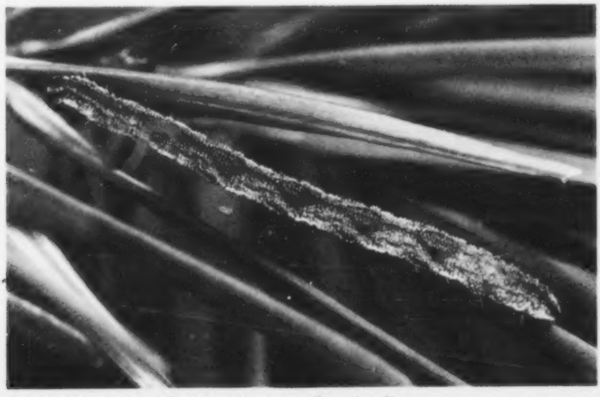
Similar species: No similar species occur in British Columbia.



Dorso-lateral view of mature larva on lodgepole pine



Dorso-lateral view of mature larva on Sitka spruce



Dorso-lateral view of mature larva on Douglas-fir

Eupithecia unicolor (Hulst)

Hosts: Principal host is western redcedar; other hosts include yellow-cedar, Rocky Mountain juniper and various ornamental cedars, junipers and cypresses.

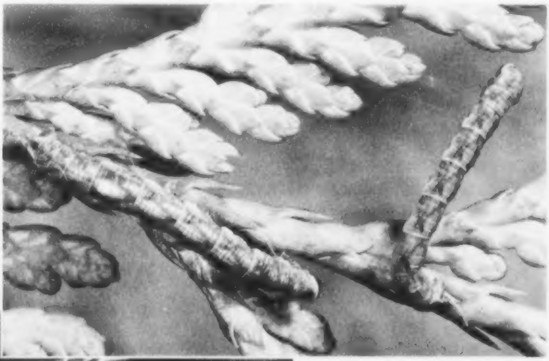
Distribution: Throughout coastal British Columbia; south to California and New Mexico.

Description: Mature larva up to 20 mm long. Twig mimic. Head, brown with dark mottle. Body, mottled yellowish green; dorsum, faint yellow diamond pattern; dark green middorsal pinstripe.

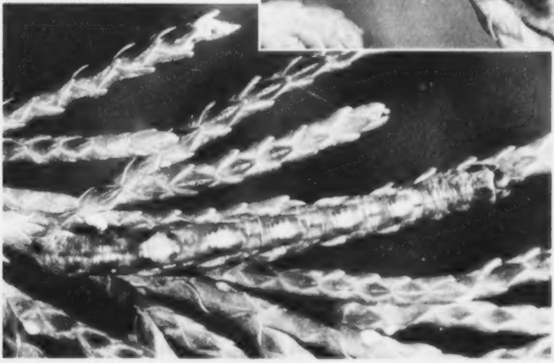
Bionomics: This species overwinters as a mid-instar larva. Larval feeding resumes in March and continues until May. Pupation occurs in June. Adults emerge in July, mate and lay eggs. Larvae emerge soon after and feed until the onset of cold weather.

Damage: *Eupithecia unicolor* is a common, innocuous, solitary defoliator.

Similar species: *Digrammia setonana* (p. 73), *D. triviata* (p. 74), *E. niphadophilata* (p. 94), *E. placidata* (p. 100) and *Stamnoctenis morrisata* (p. 153) resemble *E. unicolor*. All have larvae with complex color patterns that resemble Rocky Mountain juniper twigs. Although superficially similar, *E. unicolor* has its own distinct color pattern of dashes, lines and geometrical shapes.



Mature (left) and penultimate-instar (right) larvae on western redcedar



Dorsal view of mature larva on western redcedar

Gabriola dyari Taylor

Hosts: Principal hosts are western hemlock and Douglas-fir; other hosts include western redcedar, amabilis fir, grand fir, subalpine fir, Engelmann spruce and mountain hemlock.

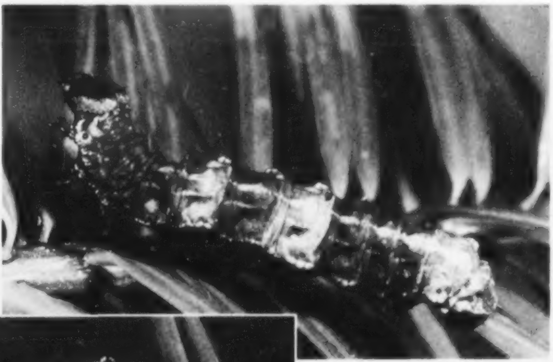
Distribution: Generally distributed throughout British Columbia from the Nass and upper Fraser River drainages south; south to California.

Description: Mature larva up to 20 mm long. This species has 2 distinct color forms. The head of the more common rusty brown form is light tan with reddish brown mottling; the vertex is moderately cleft. Body, stocky with numerous swellings; rusty brown with white dorsal patches on the second, fourth and eighth abdominal segments. The second, less common, form is chocolate brown with greyish white dorsal patches.

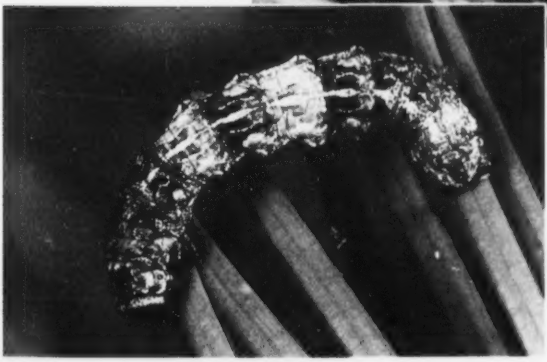
Bionomics: This species appears to overwinter in the egg stage. Larvae are present from May to July. Pupation occurs in June or July, and adults emerge from July to August.

Damage: *Gabriola dyari* is a common, innocuous, solitary defoliator.

Similar species: No similar species occur in British Columbia.



Dorso-lateral view of mature larva (rusty brown form) on Douglas-fir



Dorso-lateral view of mature larva (brown form), on Douglas-fir

Glena nigricaria (Barnes & McDunnough)

Hosts: Principal host is ponderosa pine; other hosts include lodgepole pine and Douglas-fir.

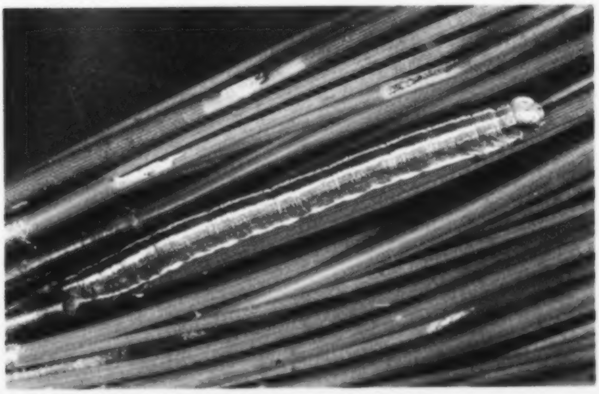
Distribution: Southern interior of British Columbia; south to Mexico.

Description: Mature larva up to 32 mm long. Head, yellowish green with red cheeks and a white bar over each lobe. Body, medium green with yellowish white addorsal and subspiracular stripes.

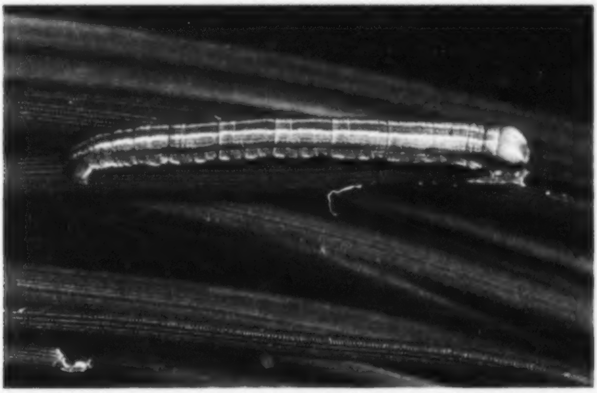
Bionomics: This species overwinters in the pupal stage. Larvae are present from mid-July to early September. Pupation occurs in late August or September.

Damage: *Glena nigricaria* is a common, innocuous, solitary defoliator.

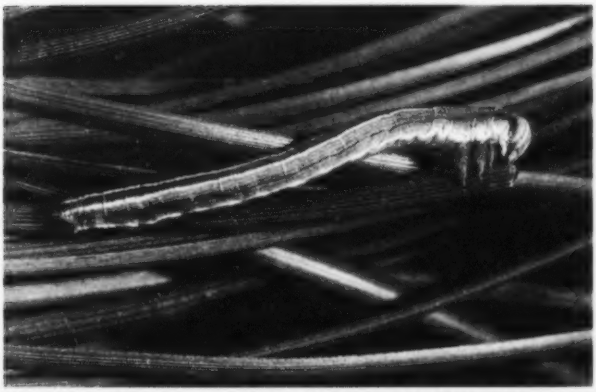
Similar species: *Macaria adonis* (p. 124), *Macaria marmorata* (p. 126) and *Sabulodes edwardsata* (p. 152). *Glena nigicaria* can be distinguished from these by its more narrowly separated dorsal stripes.



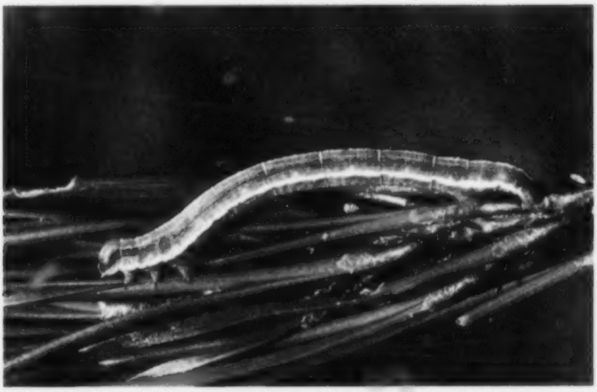
Dorso-lateral view of mature larva on ponderosa pine



Dorso-lateral view of early instar larva, feeding on ponderosa pine



Dorso-lateral view of mid-instar larva, feeding on ponderosa pine



Lateral view of mid-instar larva (unusual lateral red dashes) on ponderosa pine

Hemithea aestivaria (Hübner)
Common emerald

Hosts: Principal coniferous hosts are eastern white-cedar and European larch; nonconiferous hosts include Garry oak and numerous shrub and hardwood species.

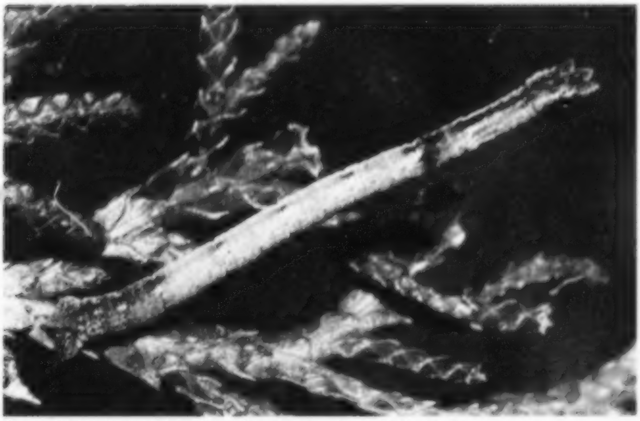
Distribution: Introduced Eurasian species. In North America, this Old-World species is known only in southwestern British Columbia.

Description: Mature larva up to 27 mm long. Twig mimic. Head, brown with black markings; vertex, deeply cleft. Body, elongate, smooth and green, with dark brown and white markings at both the anterior and posterior ends; 2 prominent tubercles on dorsum of first thoracic segment.

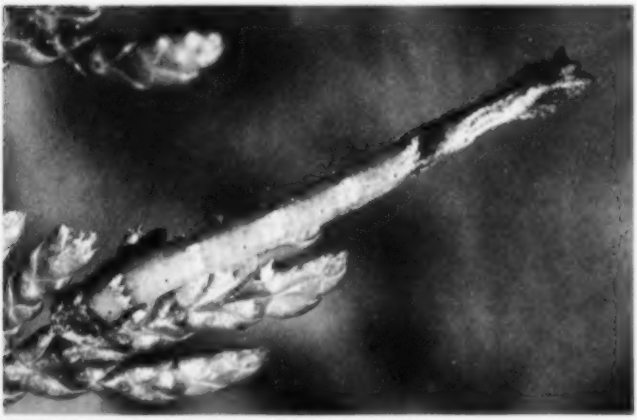
Bionomics: This species overwinters as a mid-instar larva. Larval feeding resumes in the spring and continues until June. Pupation occurs in June; adults emerge from June to July.

Damage: The common emerald is a relatively uncommon, solitary defoliator.

Similar species: No similar species occur in British Columbia.



Dorso-lateral view of mature larva on eastern white-cedar



Dorso-lateral view of mature larva on eastern white-cedar

Hydriomena divisaria (Walker)

Hosts: Principal hosts in British Columbia are Engelmann spruce and white spruce; other hosts in east include balsam fir, eastern hemlock and tamarack.

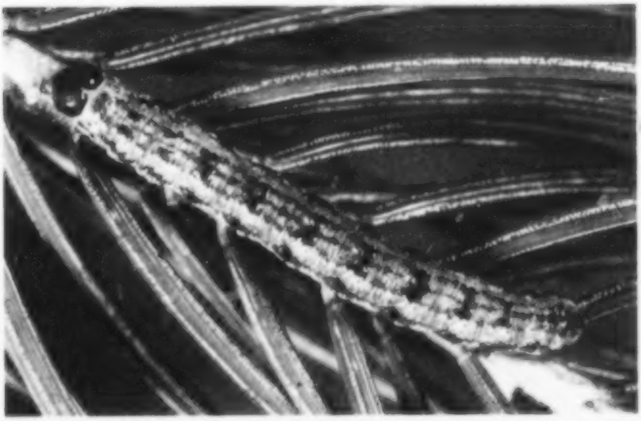
Distribution: Rocky Mountain Trench and occasionally at mid- to high-elevation sites elsewhere in the south and central interior of British Columbia; east to Newfoundland, and south to North Carolina.

Description: Mature larva up to 18 mm long. Head, rusty brown with dark markings on each lobe. Body, cream colored with grey to pinkish grey mottle; dark grey middorsal H-shaped marking on dorsum of each abdominal segment; dark grey spiracular stripe.

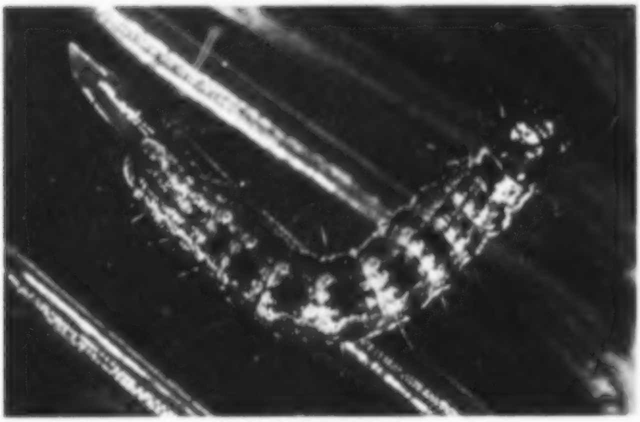
Bionomics: This species overwinters in the pupal stage. Adults emerge from late May to June. Larvae are present from August to September, and pupation occurs in September or October.

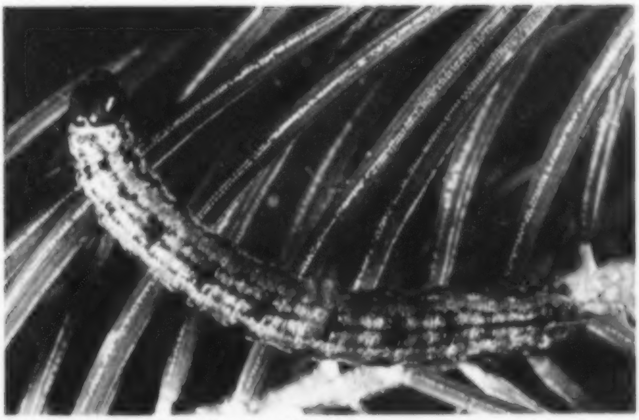
Damage: *Hydriomena divisaria* is a relatively uncommon solitary defoliator.

Similar species: No similar species occurs on white or Engelmann spruce in British Columbia.



Dorsal view of mature larva on white spruce


Dorsal view of early instar larva on white spruce


Dorsal view of mid-instar larva on white spruce

Hydriomena irata Swett

Hosts: Principal hosts are Douglas-fir, western hemlock and Sitka spruce; other hosts include amabilis fir, grand fir, subalpine fir and mountain hemlock.

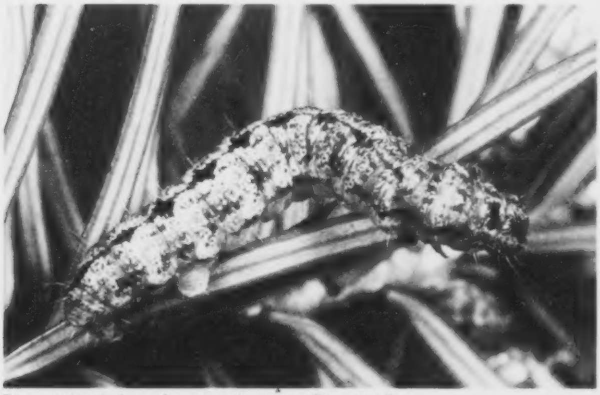
Distribution: Generally distributed throughout coastal British Columbia; south to California.

Description: Mature larva up to 20 mm long. Head, cream colored with dark herringbone pattern on each lobe. Body, cream colored with grey mottle; dark middorsal cross-shaped mark on dorsum of each abdominal segment.

Bionomics: This species overwinters as a mid-instar larva. Larval feeding resumes in April and continues until early June. Pupation occurs in June. Adults emerge from late June to July, mate and lay eggs. Larvae emerge soon after and feed until the onset of cold conditions.

Damage: *Hydriomena irata* is a common, innocuous, solitary defoliator.

Similar species: *Hydriomena speciosata* (p. 115) is similar, but somewhat darker.



Dorso-lateral view of mature larva, on Douglas-fir

Hydriomena speciosata Packard

Hosts: Principal hosts are Douglas-fir, western hemlock and lodgepole pine; other hosts include grand fir, mountain hemlock and Sitka spruce.

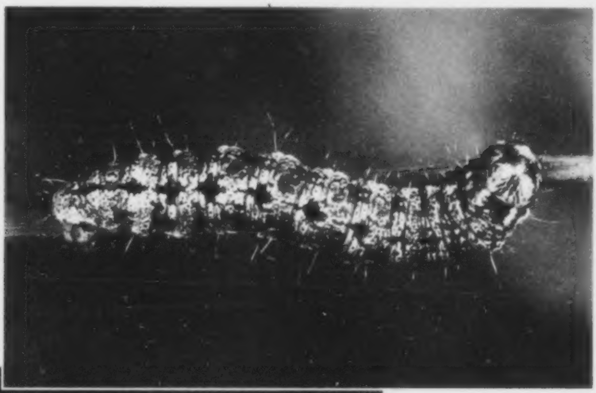
Distribution: Generally distributed throughout coastal British Columbia; south to California.

Description: Mature larva up to 20 mm long. Head, brown with black herringbone markings. Body, cream colored, with dark mottling; dark middorsal cross-shaped mark on dorsum of each abdominal segment.

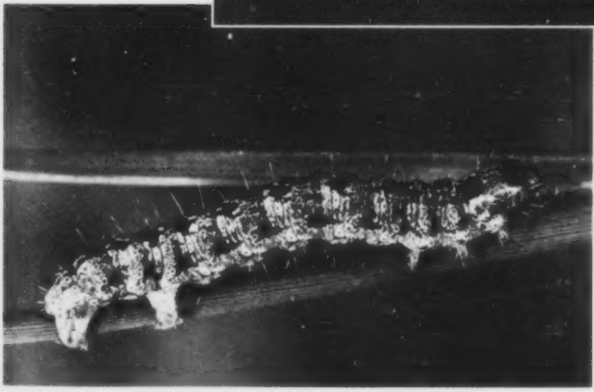
Bionomics: This species overwinters as a mid-instar larva. Larval feeding resumes in April and continues until late May. Pupation occurs in May or June. Adults emerge in June, mate and lay eggs. Larvae emerge soon after and feed until the onset of cold weather.

Damage: *Hydriomena speciosata* is a relatively uncommon, solitary defoliator.

Similar species: *Hydriomena irata* (p. 114) is similar, but a somewhat lighter color.



Dorsal view of mature larva on lodgepole pine



Lateral view of mature larva on lodgepole pine

Hypagyrtis piniata (Packard)

Hosts: Principal hosts are Douglas-fir, western hemlock, Engelmann spruce and white spruce; other hosts include western larch, tamarack, lodgepole pine, western white pine, ponderosa pine, western redcedar and subalpine fir.

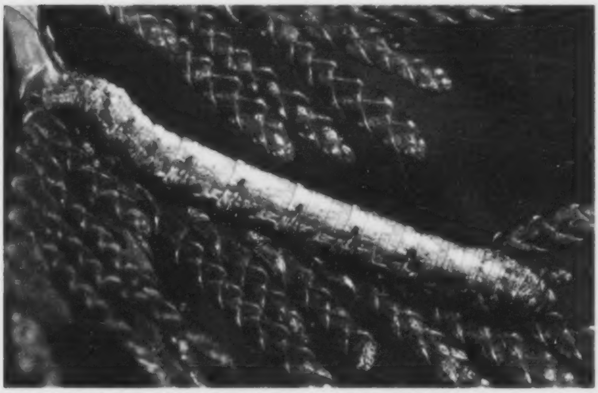
Distribution: Generally distributed throughout the interior of British Columbia; east to Newfoundland, and south to North Carolina and Washington.

Description: Mature larva up to 27 mm long. Head, light brown with dark mottle. Body, light reddish brown; pale yellow diamond pattern on dorsum; black chevron on dorsum of each abdominal segment.

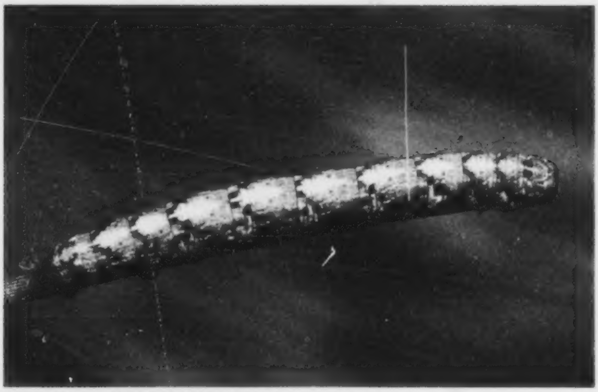
Bionomics: This species overwinters in the larval stage. Larvae resume feeding in spring and continue until June or July. Pupation occurs in July or August. Adults emerge from July to August, mate and lay eggs. Eggs hatch soon after, and the larvae feed until the onset of cold weather.

Damage: *Hypagyrtis piniata* is a common, innocuous, solitary defoliator.

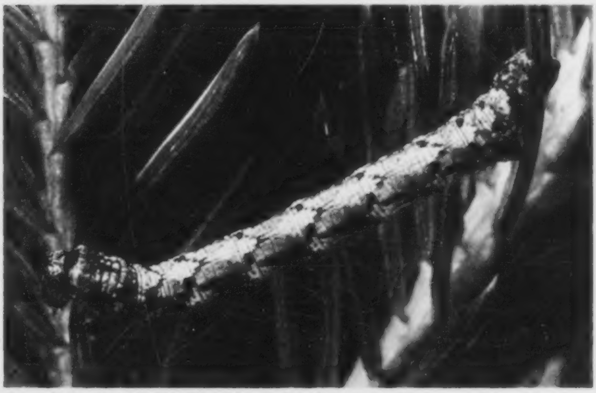
Similar species: No similar species occur in British Columbia.



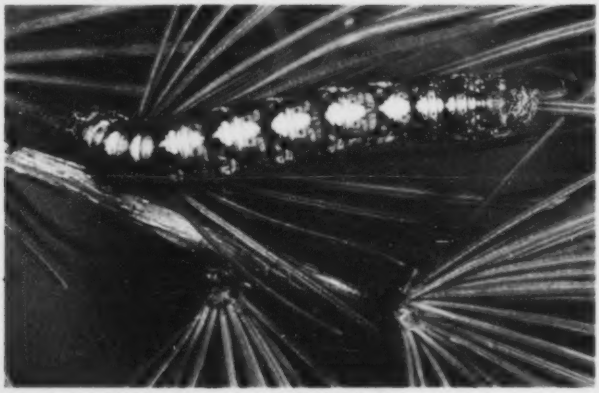
Dorso-lateral view of prepupal larva on western redcedar



Dorsal view of mature larva on ponderosa pine



Dorso-lateral view of mature larva on white spruce



Dorsal view of mature larva on western larch

Lambdina fiscellaria fiscellaria (Guenée)
Hemlock looper

Hosts: Principal hosts in British Columbia are subalpine fir, white spruce and tamarack; other common hosts in eastern Canada include balsam fir and eastern hemlock; nonconiferous hosts include white birch, trembling aspen and willow.

Distribution: Peace River area of northeast British Columbia; east to Newfoundland, and south to Georgia.

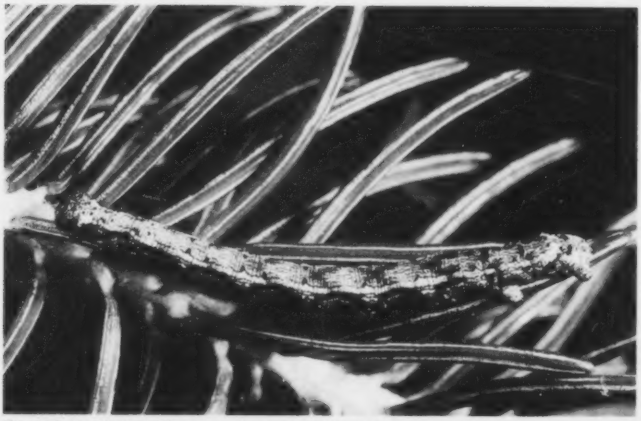
Description: Mature larva up to 30 mm long. Head, grey with 8 prominent black spots. Body, light to dark grey, with a complex pattern of alternating grey to cream longitudinal lines; 4 prominent dark spots on the dorsum of each abdominal segment.

Bionomics: This species overwinters as eggs laid on bark and lichens in the crowns of host trees. Eggs hatch from late May to early June. The young larvae initially feed on the undersides of new needles; as the larvae mature, they feed on foliage of all ages. The larvae are wasteful feeders and leave behind partially consumed needles. The accumulation of these needles causes heavily infested trees to appear scorched.

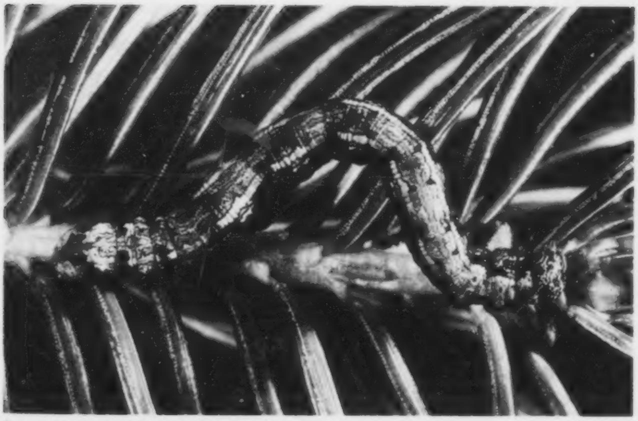
Larvae are present from June to early September. Pupation occurs on foliage or tree trunks in August or early September. The pupal stage lasts 10 to 14 days. Adults are in flight from September to October.

Damage: The hemlock looper is not known to have caused notable defoliation in British Columbia. Major outbreaks have occurred in eastern Canada. Hemlock looper damage usually occurs in mature stands where severe defoliation can result in growth reduction, top kill and tree mortality.

Similar species: Western hemlock looper (p. 120) and western oak looper (p. 122) are similar, but do not occur in northeast British Columbia.



Dorso-lateral view of mature larva on white spruce



Dorsal view of mature larva on white spruce

Lambdina fiscellaria lugubrosa (Hulst)
Western hemlock looper

Hosts: Principal hosts are western hemlock, Douglas-fir and western redcedar; other hosts include subalpine fir, amabilis fir, grand fir, Engelmann spruce, white spruce, Sitka spruce and western larch. During outbreaks, this looper will also feed on understorey shrubs.

Distribution: Generally distributed throughout British Columbia from the Nass and upper Fraser River drainages south; north to southeast Alaska, and south to California.

Description: Mature larva up to 30 mm long. Head, brown with 8 prominent black spots. Body, light to dark grey, with a complex pattern of alternating grey to cream longitudinal lines; 4 prominent dark spots on the dorsum of each abdominal segment.

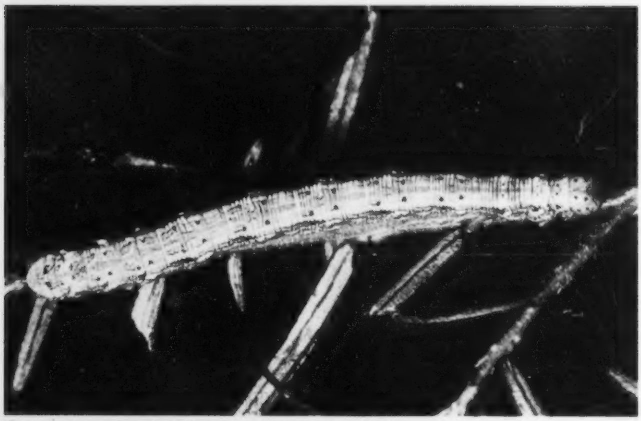
Bionomics: This species overwinters as eggs laid on moss, lichens or bark. Eggs hatch from late May to early June. The young larvae initially feed on the undersides of new needles; as the larvae matures, they feed on foliage of all ages. The larvae are wasteful feeders and leave behind partially consumed needles. The accumulation of these needles causes heavily infested trees to appear scorched.

Larvae are present from June to early September. Pupation occurs on foliage or tree trunks in August or early September. The pupal stage lasts 10 to 14 days. Adults are in flight from September to October.

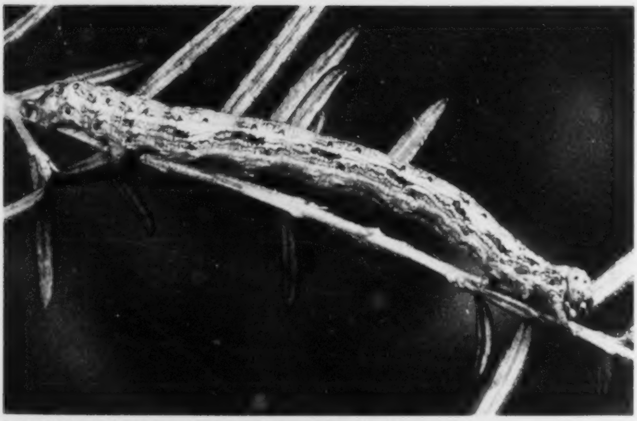
Damage: The western hemlock looper is one of the most destructive forest defoliators in British Columbia. Major outbreaks have occurred on the coast (Vancouver Island and adjacent south coast from 1945 to 1946) and in the interior wetbelt (upper Fraser River, 1954 to 1955 and 1991 to 1992; North Thompson–Wells Grey Park, 1976 and 1991 to 1992; Arrow Lakes, 1972 to 1973; Shuswap Lake, 1983 to 1984; Horsefly Lake–Quesnel Lake, 1946, 1984, and 1991 to 1992; and Revelstoke, 1945 to 1947, 1972 to 1973, 1982 to 1983, and 1991 to 1993).

Western hemlock looper damage usually occurs in mature stands where severe defoliation results in growth reduction, top kill and tree mortality.

Similar species: Hemlock looper (p. 118) is similar, but does not occur west of the Rocky Mountains. Western oak looper (p. 122) is also similar, but this species only occurs on Douglas-fir (the only host common to both species) in mixed stands where Garry oak is its preferred host.



Dorsal view of mature larva on western hemlock



Lateral view of mature larva on western hemlock

Lambdina fiscellaria somniaria (Hulst)
Western oak looper

Hosts: Principal coniferous host is Douglas-fir; otherwise restricted to Garry oak.

Distribution: Throughout the range of Garry oak in south coastal British Columbia; south to Oregon.

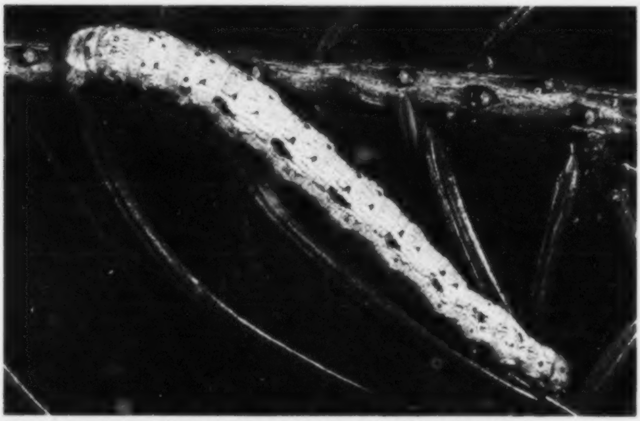
Description: Mature larva up to 30 mm long. Head, brown with 8 prominent black spots. Body, light to dark grey, with a complex pattern of alternating grey to cream longitudinal lines; 4 prominent dark spots on the dorsum of each abdominal segment.

Bionomics: This species overwinters as eggs laid on moss, lichens or bark. Eggs hatch from May to early June. The young larvae initially feed on the new foliage; as the larvae mature they feed on foliage of all ages. The larvae are wasteful feeders and leave behind partially consumed needles. The accumulation of partially consumed needles causes heavily infested trees to appear scorched.

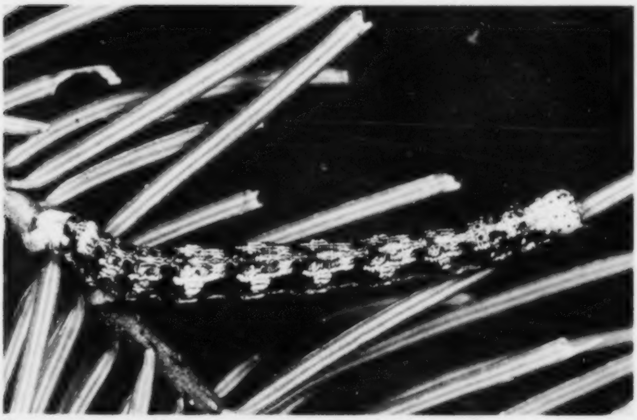
Larvae are present from June to early September. Pupation occurs on foliage, on tree trunks or moss in August or early September. The pupal stage lasts 10 to 14 days. Adults are in flight from September to October.

Damage: The western oak looper periodically causes localized severe defoliation of Garry oak, as well as of Douglas-fir occurring in or adjacent to infested oak stands. Garry oak tolerates repeated defoliation reasonably well, whereas Douglas-fir often is seriously weakened and may subsequently be attacked and killed by Douglas-fir beetle. Outbreaks were recorded in the Christmas Hill area of Victoria from 1946 to 1948 and from 1958 to 1962; a recurring outbreak has continued on Mount Maxwell, on Salt Spring Island, from 1978 to 2003.

Similar species: Hemlock looper (p. 118) is similar, but does not occur west of the Rocky Mountains. Western hemlock looper (p. 120) is also similar, but is unlikely to occur on Douglas-fir (the only host common to both species) growing in mixed stands with Garry oak.



Dorso-lateral view of mature larva (light color form) on Douglas-fir



Dorso-lateral view of mature larva (dark form) on Douglas-fir

Macaria adonis (Barnes & McDunnough)

Hosts: Principal host is ponderosa pine; also occurs on lodgepole pine.

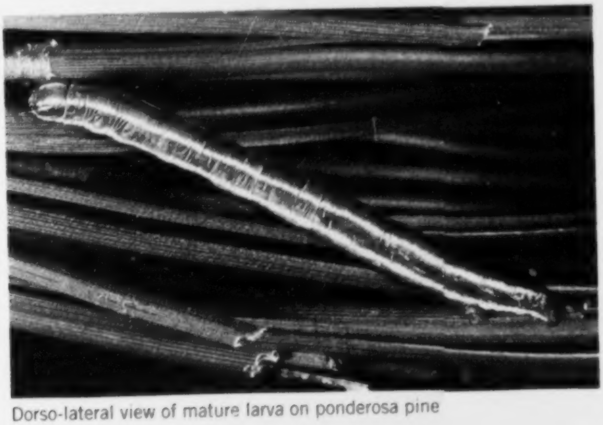
Distribution: Throughout the southern interior of British Columbia and on Vancouver Island; south to California.

Description: Mature larva up to 32 mm long. This species has 2 distinct color forms. The more common green form has a green head with a yellowish white stripe on each lobe and reddish brown cheeks. Body, green with a faint middorsal green stripe over a creamy green dorsum; white to yellowish white subdorsal stripes continue onto head. Spiracular stripe, yellowish white. Lateral slit-like indentations in the supraspiracular area. The less common purple form has similar markings. The color pattern of the mid-instar larva is unlike that of the mature larva.

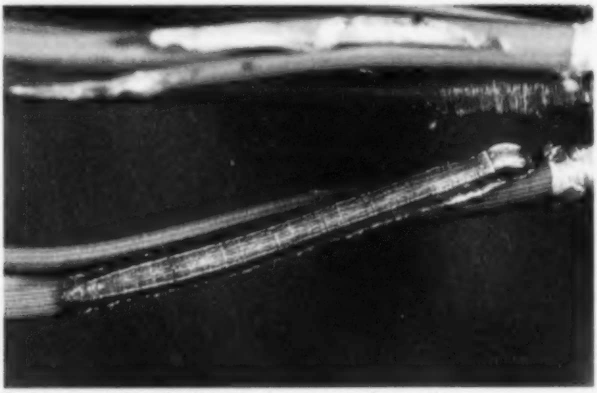
Bionomics: This species overwinters in the pupal stage. Adults emerge April to May, larvae are present June to August, and pupation occurs in August.

Damage: *Macaria adonis* is a common, innocuous solitary defoliator.

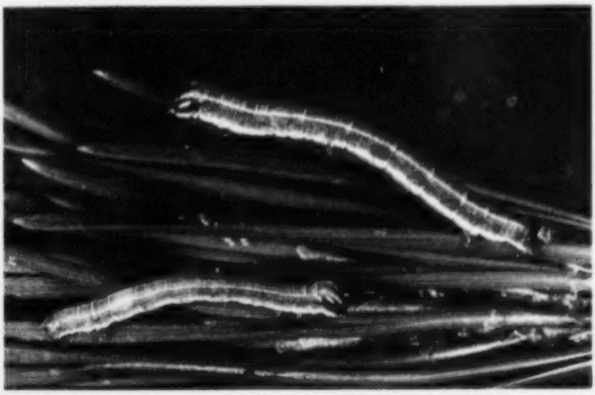
Similar species: *Macaria marmorata* (p. 126), *Glena nigricaria* (p. 108) and *Sabulodes edwardsata* (p. 152). *Macaria adonis* can be distinguished from *M. marmorata* by its larger size and different markings on the head capsule (entire cheek is reddish brown rather than reddish brown maculation on cheek); from *G. nigricaria* by the more widely separated dorsal stripes; and from *S. edwardsata* by its much later period of larval activity.



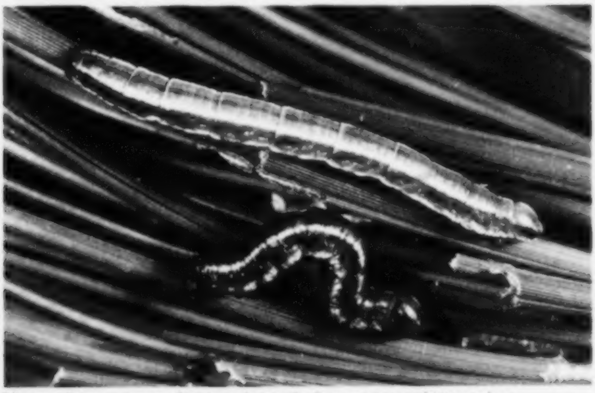
Dorso-lateral view of mature larva on ponderosa pine



Dorso-lateral view of mid-instar larva on ponderosa pine



Late-instar larva (above) and mid-instar larva (below) on lodgepole pine



Mature larvae, green form and purple form, on ponderosa pine

Macaria marmorata (Ferguson)

Hosts: Principal host is lodgepole pine; also occurs on jack pine.

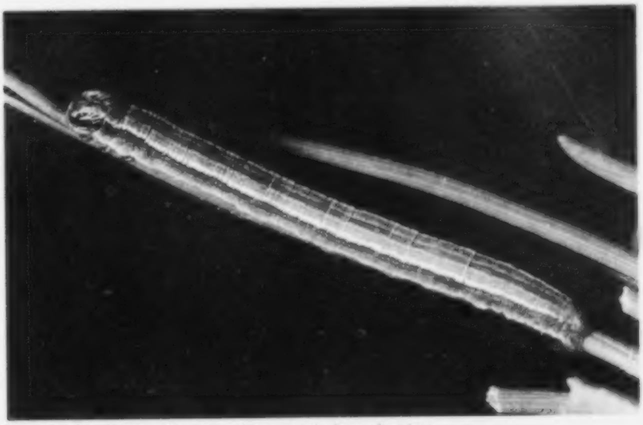
Distribution: Throughout the interior of British Columbia; east to Nova Scotia, north to the Yukon, and south to Washington.

Description: Mature larva up to 25 mm long. This species has 2 distinct color forms. The more common green form has a green head, often with a herringbone pattern over each lobe, and lateral reddish brown maculation. Body, green; green middorsal strip over creamy green dorsum; white subdorsal stripes continue onto head. Yellow spiracular stripe. Lateral slit-like indentations in the supraspiracular area. The purple form has similar markings. The color pattern of the mid-instar larva is unlike that of the mature larva.

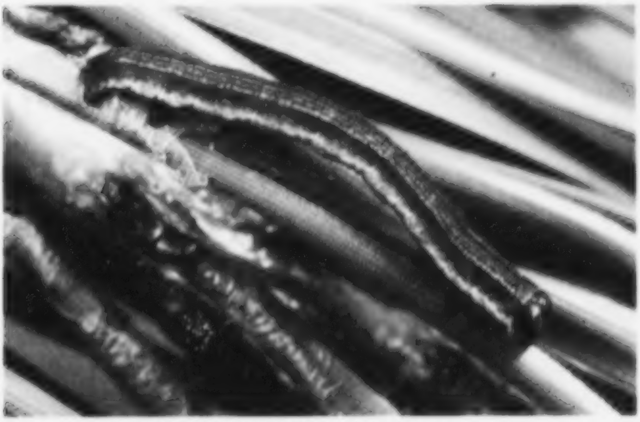
Bionomics: This species overwinters in the pupal stage. Adults emerge June to July, larvae are present July to August, and pupation occurs in August or September.

Damage: *Macaria marmorata* is a common, innocuous, solitary defoliator.

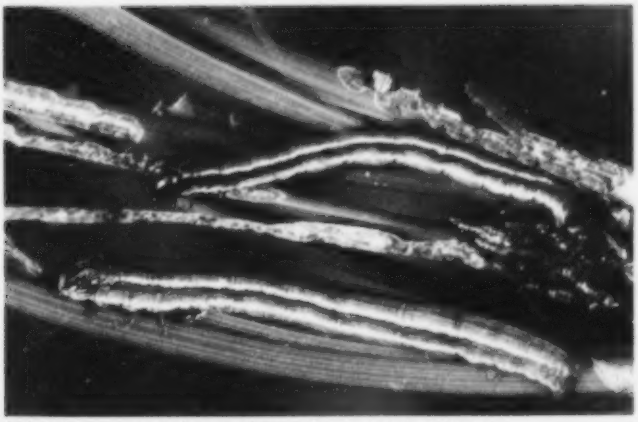
Similar species: *Macaria adonis* (p. 124), *Glena nigricaria* (p. 108) and *Sabulodes edwardsata* (p. 152). *Macaria marmorata* can be distinguished from *M. adonis* by its smaller size and different markings on the head capsule (reddish brown maculation on cheek rather than entire cheek being reddish brown); from *G. nigricaria* by the more widely separated dorsal stripes; and from *S. edwardsata* by its much later period of larval activity.



Dorso-lateral view of mature larva on lodgepole pine



Dorso-lateral view of mid-instar larva on lodgepole pine



Mature larvae, purple form and green form, on lodgepole pine

Macaria sexmaculata (Packard)

Larch looper

Hosts: Western larch and tamarack.

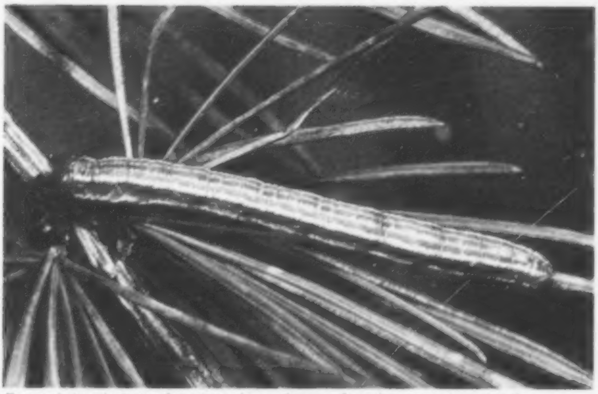
Distribution: Throughout the host range in the interior of British Columbia; east to Newfoundland and Labrador, north to the Yukon and Fort McPherson, Northwest Territories, and south to Massachusetts and Oregon.

Description: Mature larva up to 19 mm long. This species has 2 distinct color pattern forms. The more common green form has a green head and body, faint white addorsal lines, a broader white subdorsal stripe bordered below with a dark line, and a creamy yellow spiracular stripe. The brown form has a light tan head with dark markings; the body is brown with a dark brown wishbone mark on the dorsum of each abdominal segment, a broken white subdorsal stripe and a broken rusty yellow spiracular stripe.

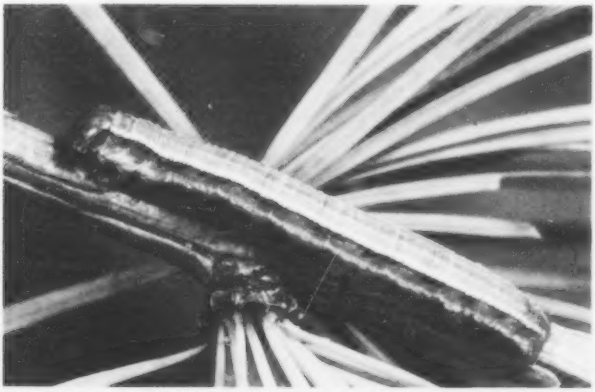
Bionomics: This species overwinters as a pupa buried in the soil. Adults emerge in June, mate and lay eggs singly on needles. Eggs hatch in about 14 days, and larvae feed from June to August. Pupation occurs in late July or August.

Damage: The larch looper is a common, frequently abundant and occasionally destructive solitary defoliator. Outbreaks were recorded in the west Kootenay (Slocan Valley, Arrow Lakes, west arm of Kootenay Lake, Kootenay River) in 1977 and 1990. Each outbreak lasted one year. Defoliation occurred late in the season (August) and no top kill or mortality was observed.

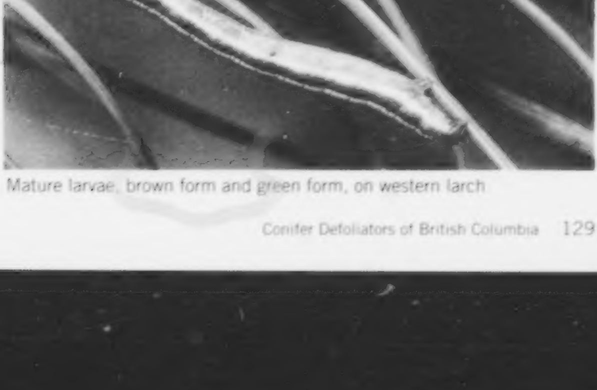
Similar species: *Macaria signaria* (p. 130) and *Melanolophia imitata* (p. 133). *Macaria sexmaculata* differs from *Macaria signaria* in that it is smaller and is restricted to western larch. It differs from *Melanolophia imitata* in that it has a prominent red band on the cheek and is much smaller.



Dorso-lateral view of mature larva (green form) on western larch



Dorso-lateral view of mature larva (green form) on western larch



Mature larvae, brown form and green form, on western larch

Macaria signaria (Hübner)

Hosts: Principal hosts are Douglas-fir, western hemlock and Engelmann spruce; other hosts include white spruce, Sitka spruce, black spruce, subalpine fir, amabilis fir, grand fir, western larch, tamarack, western redcedar and mountain hemlock.

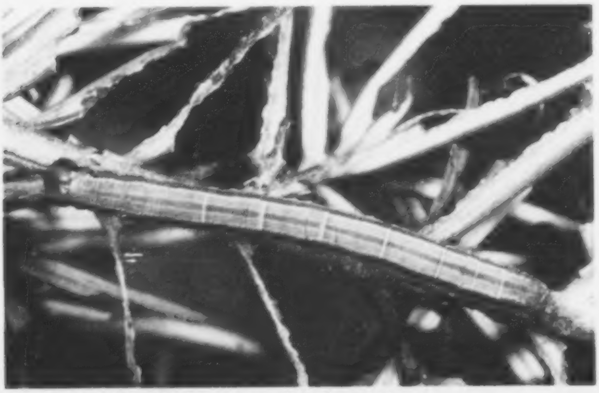
Distribution: Holarctic. Generally distributed throughout British Columbia; east to Newfoundland and Labrador, north to the Yukon, and south to California. Eurasia.

Description: Mature larva up to 22 mm long. This species has 2 distinct color forms. The head of the more common green form is yellowish green with a reddish brown band on cheeks. Body, green with a dark green middorsal stripe, a broad whitish green addorsal stripe, and a white subdorsal stripe bordered below with a fine, wavy dark line. Spiracular line, whitish green, except yellow near the spiracles. The grey form has similar markings. The color pattern of the mid-instar larva is unlike that of the mature larva.

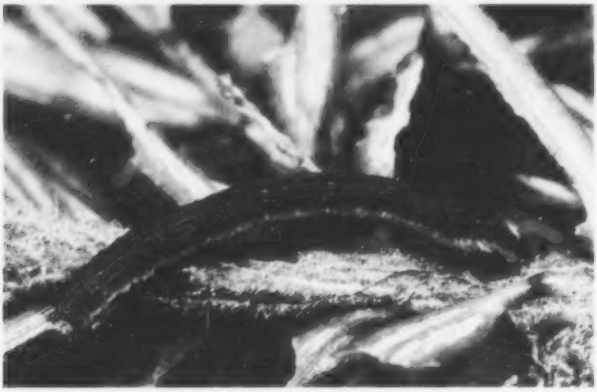
Bionomics: This species overwinters in the pupal stage. Adults emerge May to June, and females lay up to 140 eggs on foliage or lichens. Larvae are present July to August, and pupation occurs in late August.

Damage: *Macaria signaria* is a common, occasionally abundant, innocuous, solitary defoliator.

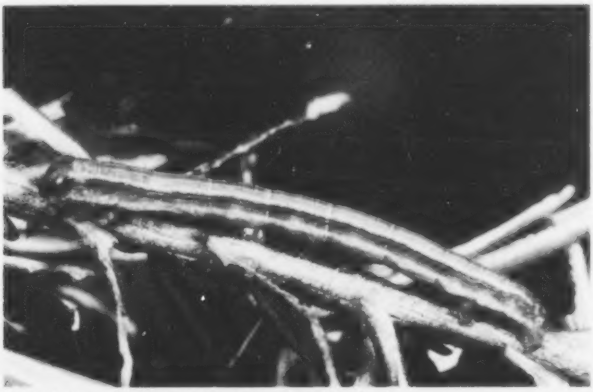
Similar species: *Macaria unipunctaria* (p. 132), *Macaria sexmaculata* (p. 128) and *Melanolophia imitata* (p. 133). *Macaria signaria* differs from *M. unipunctaria* in that the mature larva is smaller, the red band on the cheek is wider, and there are several dark wavy lines in the supraspiracular area; it differs from *Macaria sexmaculata* in that it is larger and is seldom found on larch; and from *Melanolophia imitata* in that it has a prominent red band on the cheek and is much smaller.



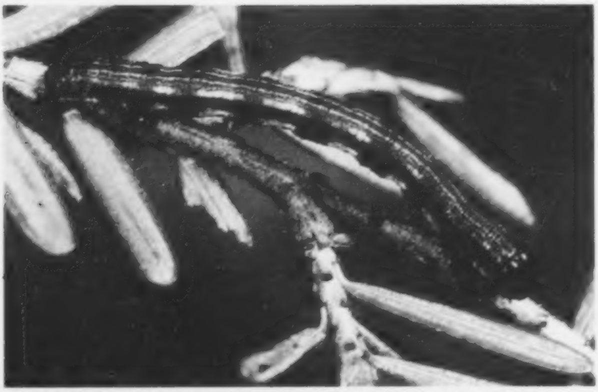
Dorsal view of mature larva on western hemlock



Dorso-lateral view of mid-instar larva on western hemlock



Lateral view of mature larva on western hemlock



Dorso-lateral view of mature larva (grey form) on western hemlock

Macaria unipunctaria (W.S. Wright)

Hosts: Douglas-fir.

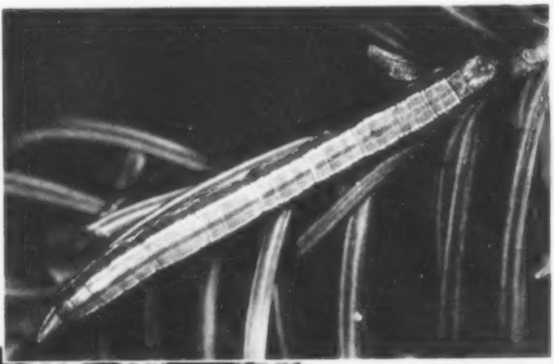
Distribution: South and central interior of British Columbia; east to mountainous western Alberta, and south to New Mexico and California.

Description: Mature larva up to 25 mm long. Head, yellowish green with red band on cheeks. Body, green; middorsal stripe, dark green; broad whitish green addorsal stripe; white subdorsal stripe. Spiracular line, whitish green, except yellow near the spiracles.

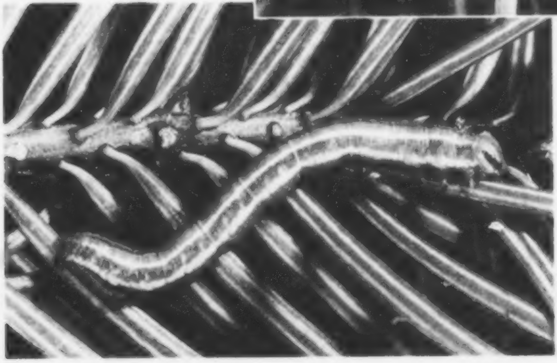
Bionomics: This species overwinters in the pupal stage. Adults emerge May to June. Larvae are present July to September, and pupation occurs in September.

Damage: *Macaria unipunctaria* is a common, innocuous, solitary defoliator.

Similar species: *Macaria signaria* (p. 130) and *Melanolophia imitata* (p. 133). *Macaria unipunctaria* differs from *M. signaria* in that the mature larva is larger, the red band on the cheek is narrower, and there are no dark wavy lines in the supraspiracular area; and from *Melanolophia imitata* in that it has a prominent red band on the cheek and is much smaller.



Dorsal view of mature larva on Douglas-fir



Lateral view of mature larva on Douglas-fir

Melanolophia imitata (Walker)
Greenstriped forest looper

Hosts: Principal hosts are Douglas-fir and western hemlock; other hosts include western redcedar, grand fir, amabilis fir, subalpine fir, Sitka spruce, Engelmann spruce, white spruce, western larch, mountain hemlock and western white pine.

Distribution: Generally distributed throughout British Columbia from the Nass and Peace drainages south; north to southeast Alaska, and south to California.

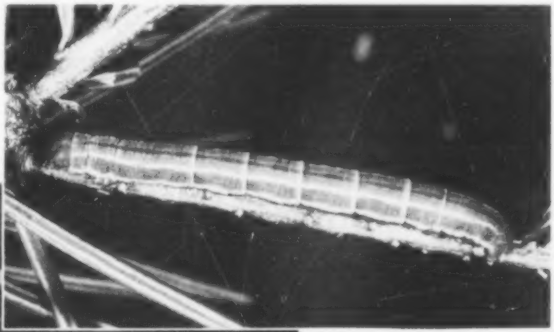
Description: Mature larva up to 37 mm long. Head, unmarked green. Body, green; dark green middorsal stripe; broad whitish green addorsal stripe; white subdorsal stripe; white subspiracular stripe. Spiracles marked by prominent yellow spots.

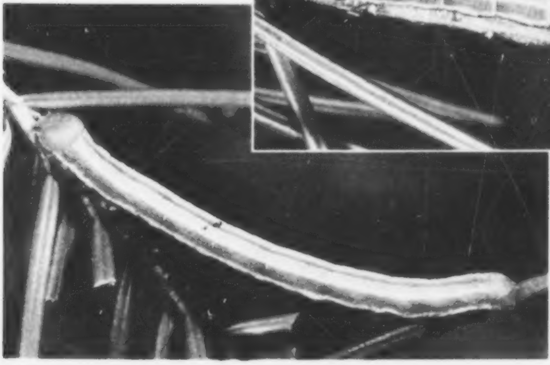
Bionomics: This species overwinters as a pupa buried in the duff. Adults emerge from mid-March (on the south coast) to mid-June (in the central interior), and deposit up to 80 eggs singly on branches and tree trunks. The larvae emerge soon after and initially feed on the undersides of needles; later instars feed openly, preferring the previous year's foliage. Larvae complete feeding by early August, drop to the ground, burrow into the litter, and pupate.

Damage: The greenstriped forest looper is a common and occasionally destructive solitary defoliator. Outbreaks were recorded on the west coast of Vancouver Island in 1952 and 1963, on the Queen Charlotte Islands in 1963, and near Revelstoke in 1952. Severe defoliation may result in top kill and occasional tree mortality.

Similar species: *Macaria* spp. (p. 124–132). *Melanolophia imitata* differs in that it does not have a prominent red bar on each side of the head capsule.

Dorso-lateral view of mature larva on Douglas-fir





Dorso-lateral view of mature larva on Douglas-fir

Nacophora mexicanaria (Grote)

Pine looper

Host: Ponderosa pine.

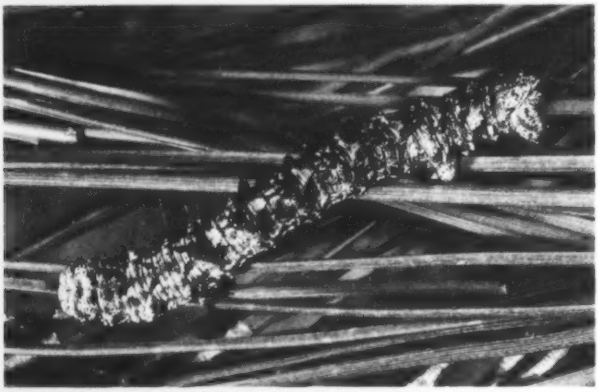
Distribution: Throughout the host range in the southern interior of British Columbia; east to South Dakota, and south to Mexico.

Description: Mature larva up to 50 mm long. Twig mimic. Larvae closely resemble dead ponderosa pine twigs. Head, cream with rust markings; vertex, cleft. Body, robust and pale grey, marked with black and rust markings. Body surface, rough with 2 pairs of red-tipped tubercles on the dorsum of each abdominal segment.

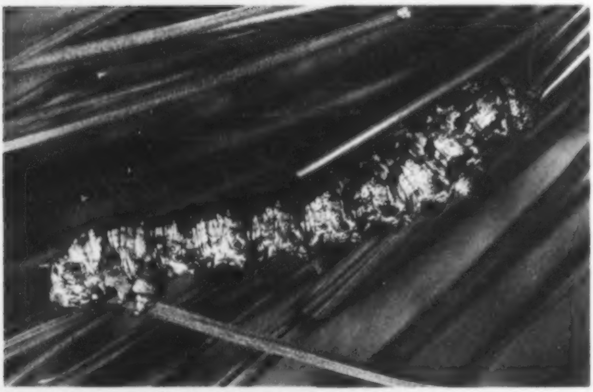
Bionomics: This species overwinters as a pupa buried in the duff. Adults emerge mid-June to early July, mate and lay up to 500 (average 160) eggs. The pale green, elliptical eggs are deposited in clusters on needles or branches in early July. These clusters may be as long as 5 cm and completely encircle the needle. The eggs hatch about 2 weeks later. There are 5 larval instars. The younger larvae feed only on a portion of the needle, causing the needles to turn brown and die. The older larvae consume entire needles. The larval period lasts about 6 weeks, at the end of which larvae migrate from the tree to the ground in search of pupation sites. Dark brown pupae may be found in the duff from September to June.

Damage: *Nacophora mexicanaria* is a rare, solitary defoliator in British Columbia. Until 1969, it had not been recorded as a pest in western North America. From 1969 to 1972, an infestation covering 40 000 ha was recorded in eastern Montana. Defoliation by pine looper can result in tree mortality, especially in younger trees. Defoliated trees may also be predisposed to secondary attack by bark beetles. The looper eats both old and new needles, and does not discriminate between young and older trees. The most severe defoliation occurs near ridge tops and on plateaus.

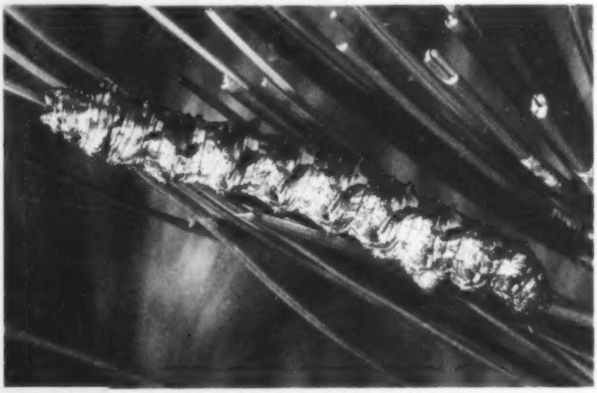
Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of mature larva on ponderosa pine



Dorso-lateral view of mature larva on ponderosa pine



Dorso-lateral view of mature larva on ponderosa pine

Nematocampa resistaria (Herrich-Schaffer)
Filament bearer

Hosts: Principal hosts are Douglas-fir and western hemlock; other hosts include western redcedar, Engelmann spruce, white spruce, western larch, tamarack, western white pine, subalpine fir and grand fir. Numerous hardwood and shrub hosts have also been recorded.

Distribution: Generally distributed throughout the interior and the south coastal regions of British Columbia; east to Nova Scotia, and south to Florida and California.

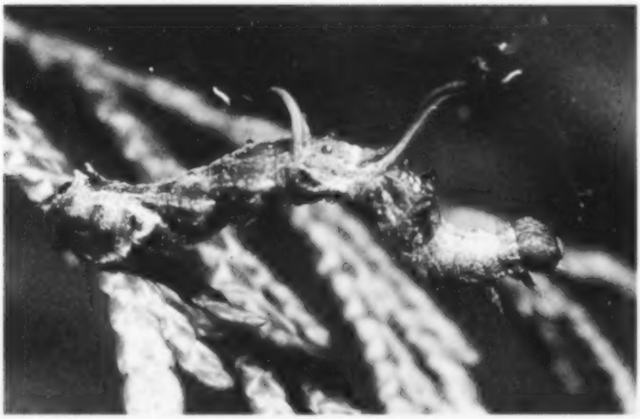
Description: Mature larva up to 21 mm long. This is a unique caterpillar with 2 pairs of white-tipped tentacles on the dorsum of the second and third abdominal segments. Head, mottled rusty brown. Body, rusty brown with prominent paired dorsal tubercles on the first and eighth abdominal segments.

Bionomics: This species overwinters in the egg stage. Larvae are present from June to July, pupation occurs in July or August, and adults emerge about 2 weeks later.

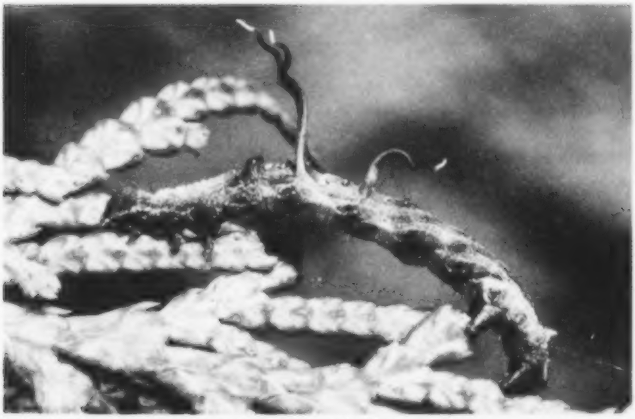
Damage: The filament bearer is a common, solitary defoliator that occasionally causes noticeable defoliation. A single outbreak was recorded in the Upper Arrow and Trout Lakes–Revelstoke area from 1971 to 1974.

During outbreaks, considerable mortality may occur in understorey western hemlock.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of mature larva on western redcedar



Lateral view of mature larva on western redcedar

Neoalcis californiaria (Packard)
Brownlined looper

Hosts: Principal host is Douglas-fir; other common hosts include western hemlock, western redcedar, eastern white-cedar and grand fir. It is occasionally found on all other conifer species native to coastal British Columbia, and also occurs on Garry oak.

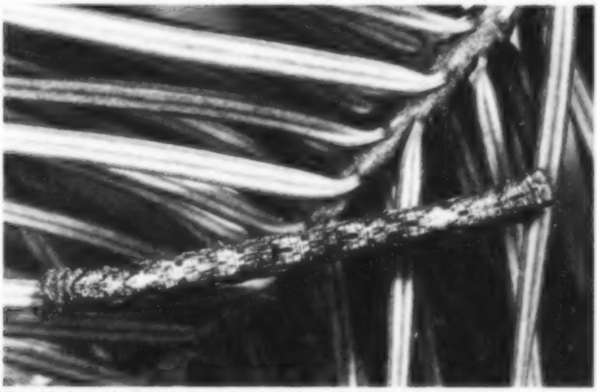
Distribution: Coastal British Columbia; south to California.

Description: Mature larva up to 35 mm long. Twig mimic. Head, tan with rust mottling; vertex, moderately cleft. Body, elongate; color, highly variable with a continuum of color forms ranging from rusty brown to light grey. Prominent subspiracular tubercles on second abdominal segment. Raised pairs of dark tubercles on the dorsum near the posterior margins of abdominal segments 2 to 8.

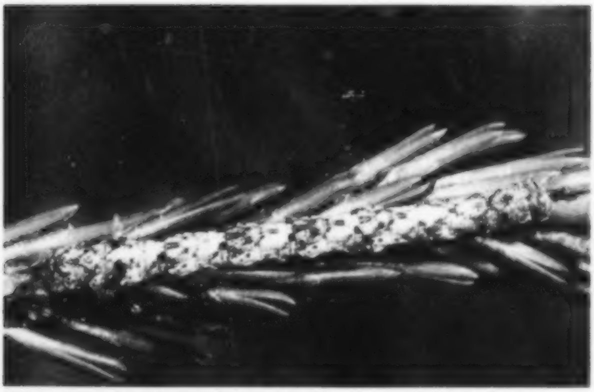
Bionomics: This species overwinters as a mid-instar larva. Larval feeding resumes in the spring and continues until June. Pupation occurs in June or July. Adults emerge in August, mate and lay eggs. Larvae emerge soon after and feed until the onset of cold weather.

Damage: The brownlined looper is a common, innocuous, solitary defoliator.

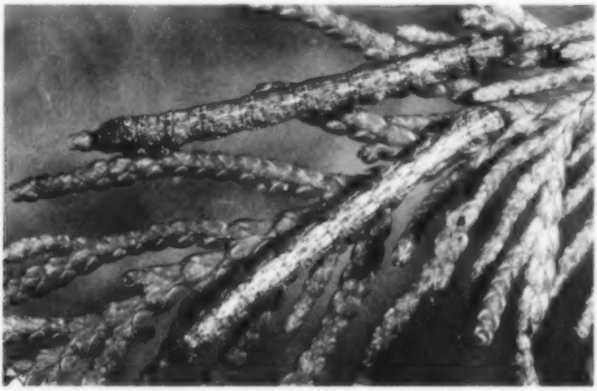
Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorsal view of mature larva (rusty brown form) on Douglas-fir



Dorso-lateral view of mature larva (grey form) on lodgepole pine



Dorsal view of two mature larvae (brown form) on eastern white-cedar

Nepytia freemani (Munroe)
Western false hemlock looper

Hosts: Principal host is Douglas-fir; other hosts include western hemlock, Engelmann spruce and subalpine fir.

Distribution: Throughout the range of the principal host in the southern interior of British Columbia; south to Washington, Montana, Idaho, and Utah.

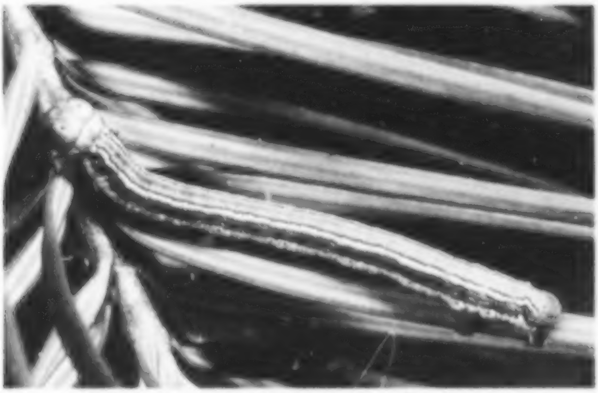
Description: Mature larva up to 25 mm long. Head, tan with black spots. Body, brown; middorsal stripe, broad and tan-colored, with a rust-colored suffusion at centre; subdorsal stripe, creamy yellow and edged with fine dark lines; supraspiracular stripe, tan containing a fine wavy dark line; spiracular stripe, broad, yellow and edged with fine dark lines. Tan areas replaced by green in prepupal larvae.

Bionomics: This species overwinters in the egg stage. Larvae emerge in late May and initially feed on the new growth. Later in the season as the current-year foliage is depleted, the larvae move toward the bole and consume older foliage. Defoliation appears first in the upper crown, then spreads to the lower crown as feeding progresses. The larvae are wasteful feeders, often consuming only parts of needles and chewing them off at their bases. The accumulation of partially consumed needles causes heavily infested trees to appear scorched. Pupation occurs on twigs or foliage in late July or August. Adults emerge from August to October. Females lay an average of 70 eggs singly or in small clusters on both sides of the host needles.

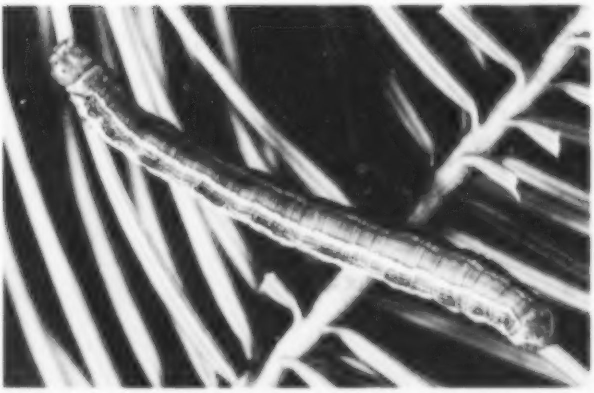
Damage: Western false hemlock looper is a common and occasionally destructive solitary defoliator. Outbreaks have been recorded in the Windermere Valley from 1947 to 1949, 1973 to 1976, and 2000 to 2003; west of Cranbrook, from 2000 to 2003; and in the north Okanagan and south Thompson areas, from 1963 to 1964, 1972 to 1976, and 1980 to 1982.

Stands heavily defoliated for 2 or more years may suffer some top kill and scattered tree mortality.

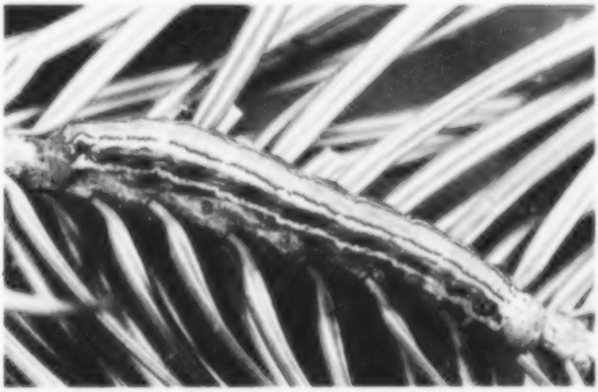
Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of penultimate-instar larva on Douglas-fir



Dorso-lateral view of mature larva on Douglas-fir



Dorso-lateral view of prepupal larva on Douglas-fir

Nepytia phantasmaria (Strecker)
Phantom hemlock looper

Hosts: Principal hosts are western hemlock and Douglas-fir; other hosts include grand fir, amabilis fir, Sitka spruce and western redcedar.

Distribution: South coastal British Columbia; south to California.

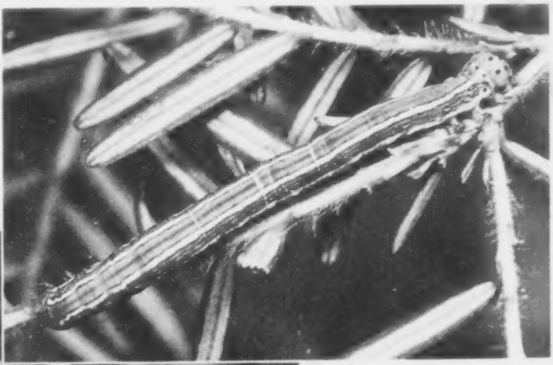
Description: Mature larva up to 28 mm long. Head, green with 10 prominent black spots. Body, yellowish green; middorsal stripe, faint green; subdorsal stripes, white, edged on either side with a fine dark green line; supraspiracular area, green with a pair of wavy, broken dark lines; spiracular stripe, yellow.

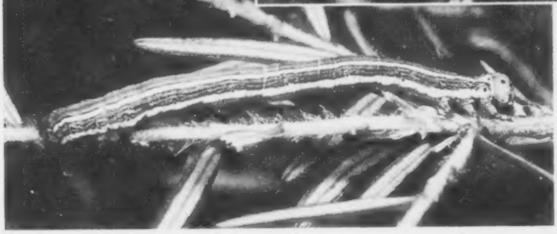
Bionomics: This species overwinters in the egg stage. Larvae emerge in late May and initially feed on new foliage. Mid- to late-instar larvae prefer to feed on older foliage. Pupation occurs on foliage in August. Adults emerge in September and October, and lay up to 115 eggs singly or in small groups on undersides of needles.

Damage: The phantom hemlock looper is a common and occasionally destructive solitary defoliator. Localized short-lived outbreaks have been recorded in municipal parks at Burnaby, New Westminster and Hope, from 1956 to 1957 and in 1994, as well as in the natural forest near Coquitlam Lake, in 1982, and near Port Mellon, in 2001. Severe defoliation may result in reduced incremental growth, top kill and tree mortality.

Similar species: No similar species occur on coniferous hosts in British Columbia.

Dorso-lateral view of mature larva on western hemlock





Lateral view of mature larva on western hemlock

Nepytia umbrosaria nigrovenaria (Packard)

Hosts: Principal hosts are Douglas-fir and western hemlock; other hosts include grand fir and amabilis fir.

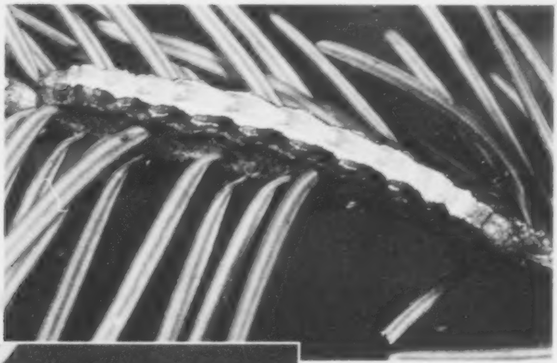
Distribution: South coastal British Columbia; south to California.

Description: Mature larva up to 35 mm long. This species has two distinct color pattern forms. Head of the more common form, light tan, covered with dark spots. Body, rusty brown; dorsum, creamy yellow marked with orange middorsal markings. In the second, rather uncommon, grey form, the orange and rusty brown markings are replaced by greyish brown markings.

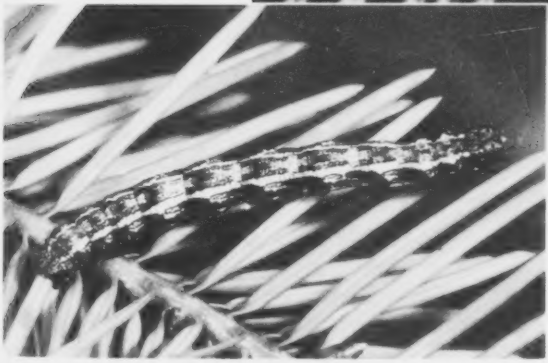
Bionomics: This species overwinters as a mid-instar larva. Larvae feed from April to June, and pupation occurs in June. Adults emerge from late July to early August, mate and lay eggs on foliage. The larvae emerge soon after and feed until the onset of cold weather.

Damage: *Nepytia umbrosaria nigrovenaria* is a relatively uncommon, solitary defoliator.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of mature larva (rusty brown form) on Douglas-fir



Dorso-lateral view of mature larva (grey form) on Douglas-fir

Pero behrensaria (Packard)

Hosts: Principal host is Douglas-fir; other hosts include western hemlock, western redcedar, grand fir, subalpine fir, amabilis fir, Engelmann spruce, white spruce, Sitka spruce and western larch.

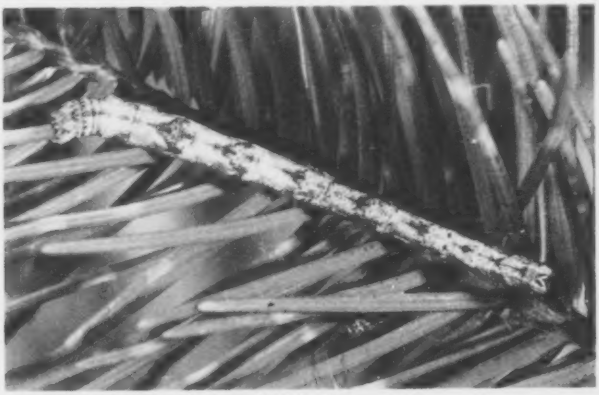
Distribution: Generally distributed throughout British Columbia from the Skeena and upper Fraser River drainages south; east to mountainous western Alberta, and south to California.

Description: Mature larva up to 40 mm long. Head, tan with grey or rust markings; vertex, cleft. Body, elongate, color highly variable with a continuum of color forms ranging from rusty brown to light grey; broken dark middorsal line or Y-shaped middorsal markings; faint yellow spiracular line.

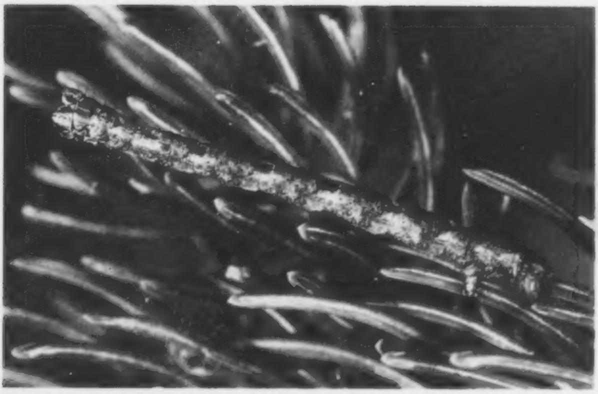
Bionomics: This species overwinters in the pupal stage. Adults emerge during May and June. Larvae are present from June to August and pupation occurs in August.

Damage: *Pero behrensaria* is a common, innocuous, solitary defoliator.

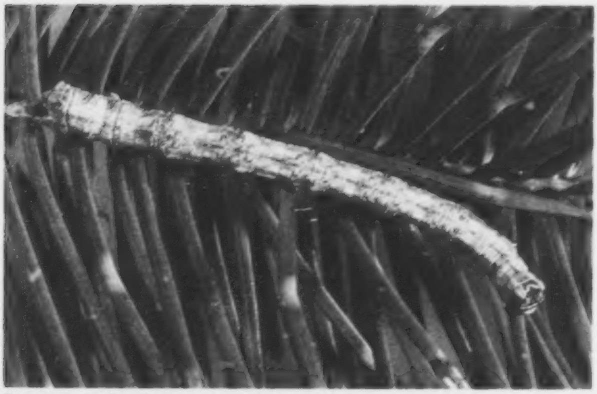
Similar species: No similar species occur on coniferous hosts in British Columbia.



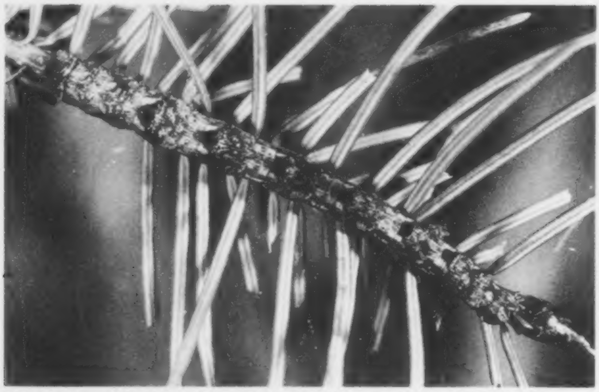
Dorsal view of mature larva on Douglas-fir



Dorso-lateral view of mature larva on Engelmann spruce



Dorsal view of mature larva on Douglas-fir



Dorsal view of mature larva on Douglas-fir

Pero mizon Rindge

Hosts: Principal coniferous hosts in British Columbia are western redcedar, eastern white-cedar and Douglas-fir. Numerous hardwood and shrub hosts have also been recorded.

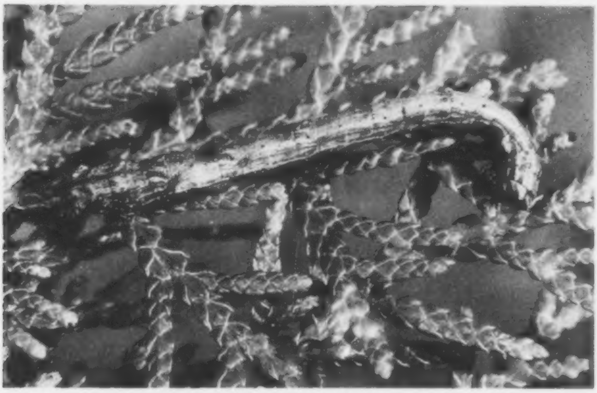
Distribution: Southern British Columbia; south to California.

Description: Mature larva up to 50 mm long. Head, tan with rust markings; vertex, cleft. Body, elongate and tan to rusty brown variously marked, often with conspicuous black wedge-shaped subdorsal markings on the fifth abdominal segment.

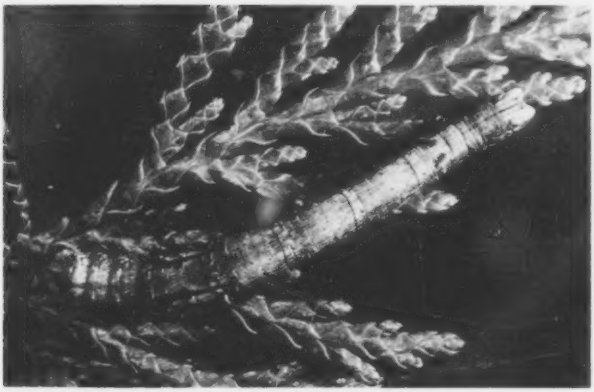
Bionomics: This species overwinters as a mid- to late-instar larva. Larval feeding resumes in early April and continues until mid-May. Pupation occurs in late May, and adults emerge in mid-June. Eggs are laid on foliage, and larvae emerge soon after. Larvae feed from August to October before sheltering for the winter.

Damage: *Pero mizon* is a relatively uncommon, solitary defoliator, but may, on occasion, be locally abundant on individual ornamental trees.

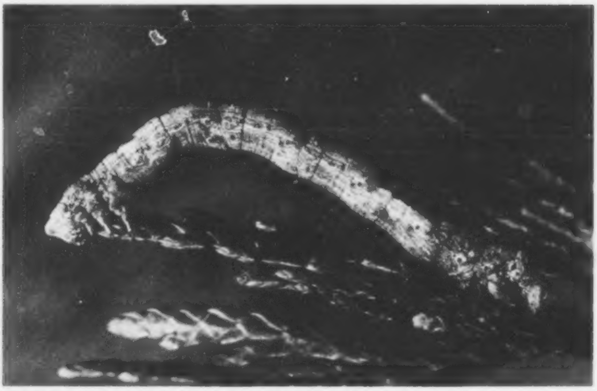
Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of mature larva on eastern white-cedar



Dorsal view of mature larva on eastern white-cedar



Lateral view of mature larva on eastern white-cedar

Pero morrisonaria (Henry Edwards)

Hosts: Principal hosts are Douglas-fir and western hemlock; other hosts include Engelmann spruce, lodgepole pine, white spruce, Sitka spruce, grand fir, amabilis fir and subalpine fir. Nonconiferous hosts include willow and alder.

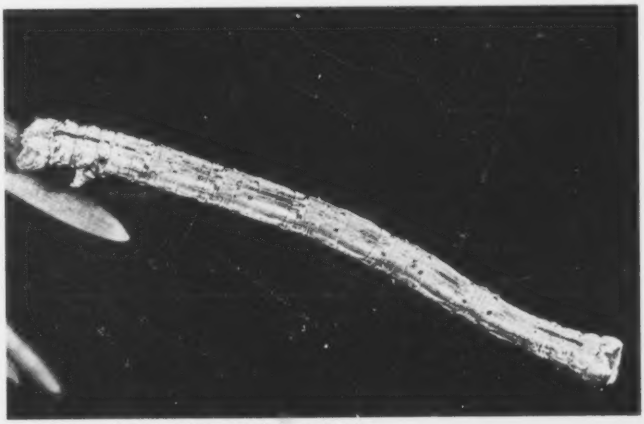
Distribution: Generally distributed throughout British Columbia south of the Skeena and Fraser River drainages; east to Newfoundland, and south to Maryland and California.

Description: Mature larva up to 32 mm long. Head, grey to tan, with dark markings; frontal triangle, dark brown to black; vertex, cleft. Body, elongate, tan to rusty brown to grey; dorsum, marked with parallel dark streaks on abdominal segments 3 to 4.

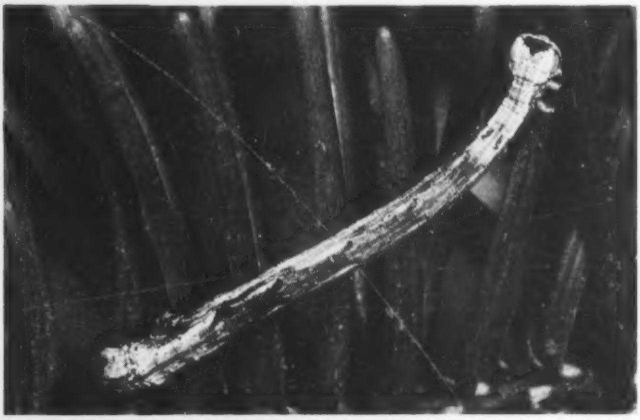
Bionomics: This species overwinters in the pupal stage. Adults emerge in July. Larvae are present from July to September, and pupation occurs in September.

Damage: *Pero morrisonaria* is a relatively uncommon, solitary defoliator.

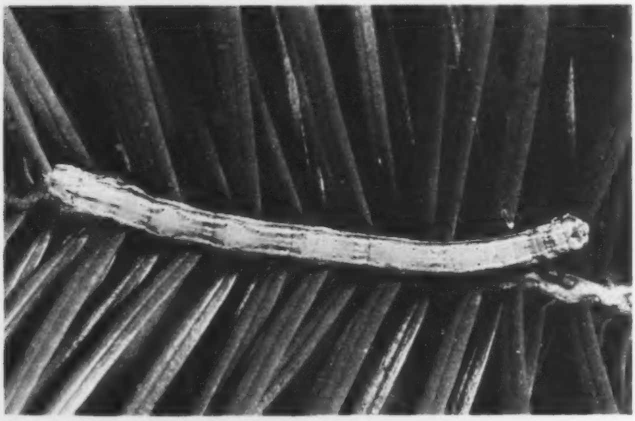
Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorsal view of mature larva on lodgepole pine



Dorsal view of mature larva on Douglas-fir



Dorsal view of mature larva on Douglas-fir

Protoboarmia porcelaria (Guenée)

Hosts: Principal host is Douglas-fir; other hosts include Engelmann spruce, white spruce, Sitka spruce, black spruce, western hemlock, western redcedar, subalpine fir, grand fir, amabilis fir, western larch and tamarack. Nonconiferous hosts include birch, willow and poplar.

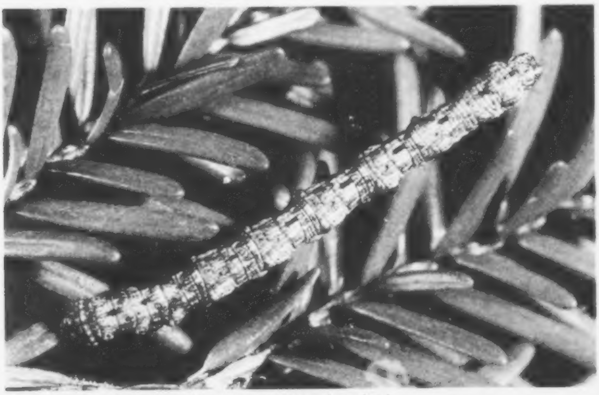
Distribution: Generally distributed throughout British Columbia; east to Newfoundland, north to the Yukon, and south to Florida, Texas and Oregon.

Description: Mature larva up to 25 mm long. Head, grey with dark mottle; vertex, moderately cleft. Body, slender; color, highly variable with a continuum of color pattern forms from brownish white to greyish white; dorsum, distinct dark Y-shaped pattern on abdominal segments 1 to 6. The upper portion of the Y is faint on some specimens. A pair of dorsal and lateral tubercles on each abdominal segment.

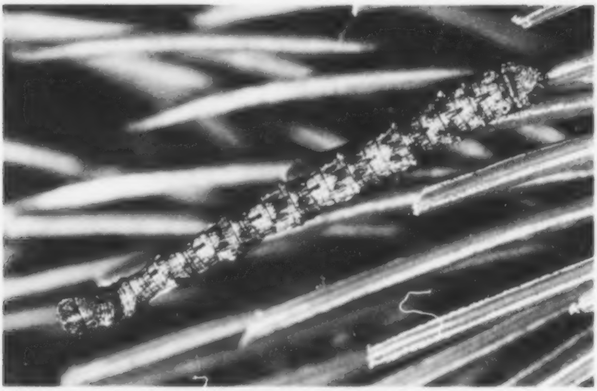
Bionomics: This species overwinters as a penultimate-instar larva. Larval feeding resumes in spring and continues until June. Pupation occurs in late June or July, and adults emerge in July. Females lay up to 150 eggs on foliage in July, and larvae emerge soon after. Young larvae feed during August and September before sheltering for the winter.

Damage: *Protoboarmia porcelaria* is a common, innocuous, solitary defoliator.

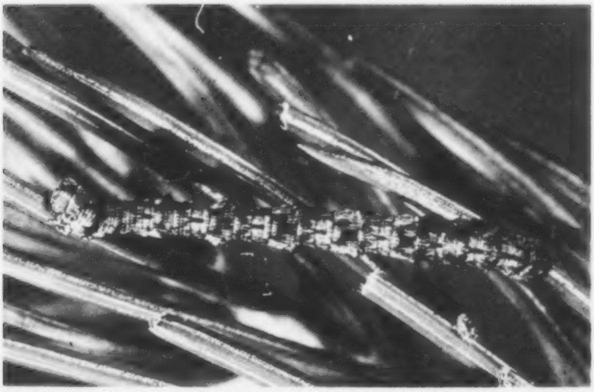
Similar species: No similar species occur on coniferous hosts in British Columbia.



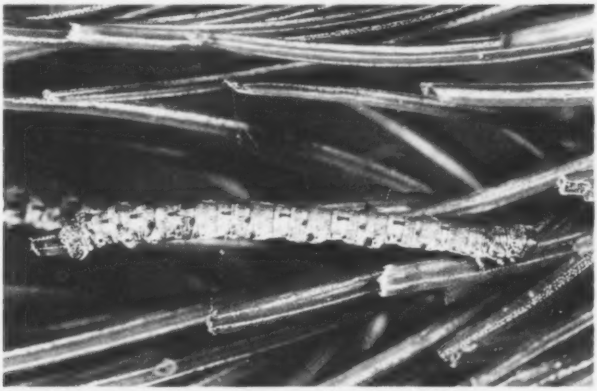
Dorsal view of mature larva on western hemlock



Dorsal view of penultimate-instar larva (light brown form) on Engelmann spruce



Dorsal view of penultimate-instar larva (grey form) on Engelmann spruce



Dorsal view of penultimate-instar larva (light grey form) on Engelmann spruce

Sabulodes edwardsata (Hulst)

Hosts: Principal hosts are Douglas-fir, lodgepole pine and ponderosa pine; other hosts include western white pine, Sitka spruce and western hemlock.

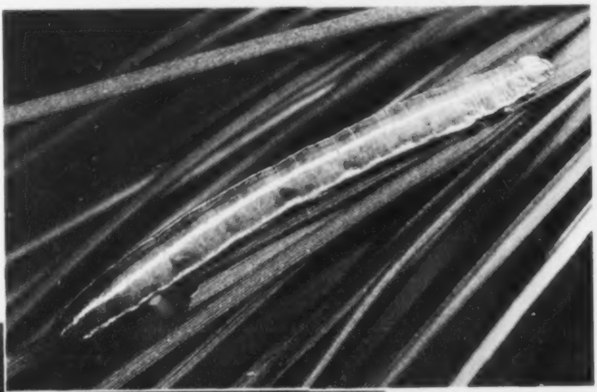
Distribution: Southern British Columbia; south to California.

Description: Mature larva up to 32 mm long. Head, reddish brown with a white band over the vertex of each lobe. Body, robust; green with a faint dark green middorsal pinstripe; prominent subdorsal white stripe extending onto the head; white spiracular stripe.

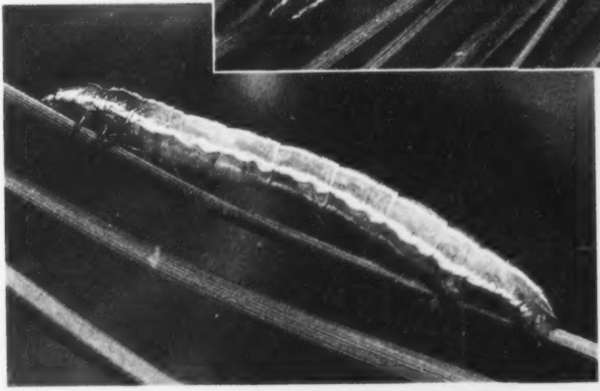
Bionomics: This species overwinters as a mid-instar larva. Larvae are present from April to June. Pupation occurs in June and adults emerge in July. Eggs are laid in July and hatch soon after. Larvae emerge in August and feed until the onset of cold weather.

Damage: *Sabulodes edwardsata* is a relatively uncommon, solitary defoliator.

Similar species: *Macaria adonis* (p. 124), *M. marmorata* (p. 126) and *Glena nigricaria* (p. 108). *Sabulodes edwardsata* can be distinguished from these species by its much earlier period of larval activity.



Dorso-lateral view of mature larva on ponderosa pine



Lateral view of mature larva on ponderosa pine

Stamnoctenis morrisata (Hulst)

Host: Rocky Mountain juniper.

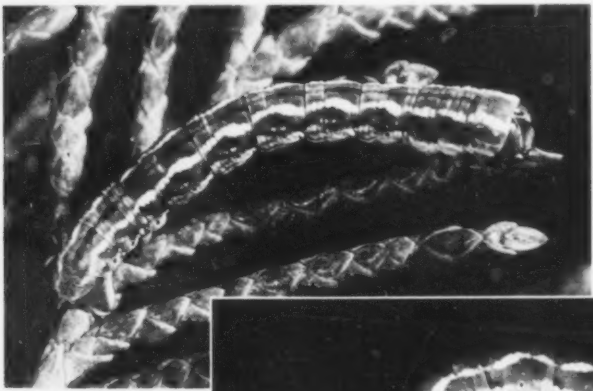
Distribution: Throughout the host range in British Columbia south of 53° latitude; south to California and Utah.

Description: Mature larva up to 24 mm long. Twig mimic. Head, green with dark markings. Body, green; thin dark green middorsal stripe; prominent wavy white subdorsal stripe; broken white spiracular stripe.

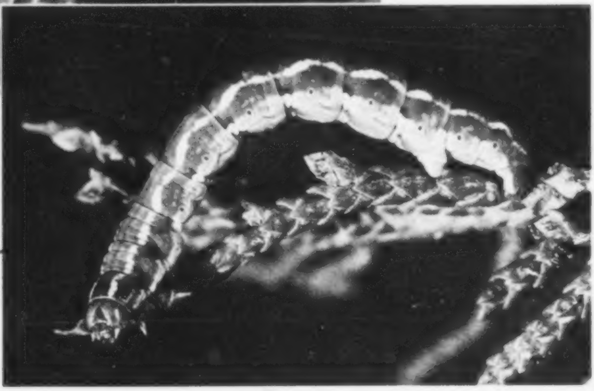
Bionomics: This species overwinters in the pupal stage. Adults emerge in July, mate, and lay eggs on host foliage. Larvae emerge soon after and are present from late July to mid-September. Pupation occurs in September.

Damage: *Stamnoctenis morrisata* is a relatively uncommon, solitary defoliator.

Similar species: *Digrammia setonana* (p. 73), *D. triviata* (p. 74), *Eupithecia niphadophilata* (p. 94), *E. placidata* (p. 100) and *E. unicolor* (p. 106) have larvae with color patterns that resemble Rocky Mountain juniper twigs. Each species, however, can readily be distinguished by its own distinct color pattern.



Dorso-lateral view of penultimate-instar larva on Rocky Mountain juniper



Lateral view of mature larva on Rocky Mountain juniper

Stenoporpia excelsaria (Strecker)

Host: Douglas-fir.

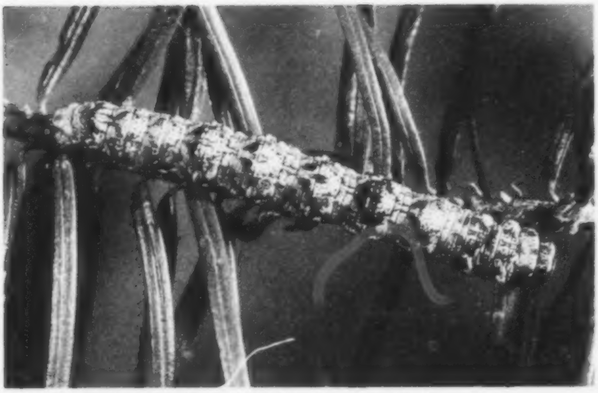
Distribution: Southern British Columbia; south to Durango, Mexico.

Description: Mature larva up to 37 mm long. Head, slightly bi-lobed, grey to rusty brown with a black herringbone pattern on each lobe; prothoracic shield, rusty orange. Body, light grey to pinkish grey; pair of oblique dashes near posterior margin of each abdominal segment. The color pattern of the mid-instar larva is unlike that of the mature larva.

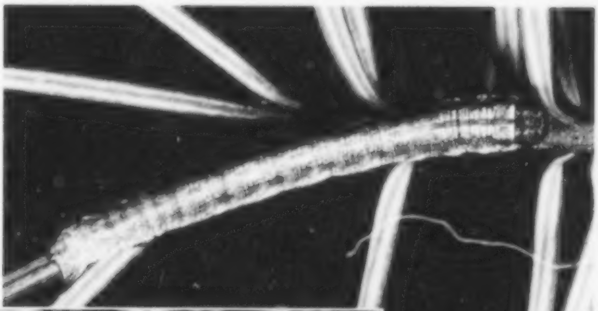
Bionomics: This species overwinters in the pupal stage. Adults emerge in July, mate and lay eggs. Larvae emerge soon after and feed until early to mid-October. Pupation occurs in October.

Damage: *Stenoporpia excelsaria* is a relatively uncommon, solitary defoliator.

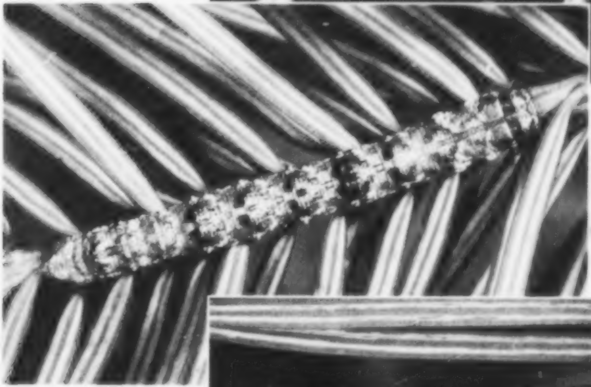
Similar species: *Stenoporpia p. albescens* (p. 156) and *S. p. satisfacta* (p. 158). *Stenoporpia excelsaria* differs from these species in that its larval stage is completed in October rather than during the following June.



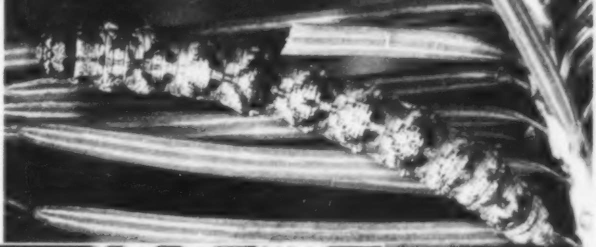
Dorsal view of mature larva (light form) on Douglas-fir



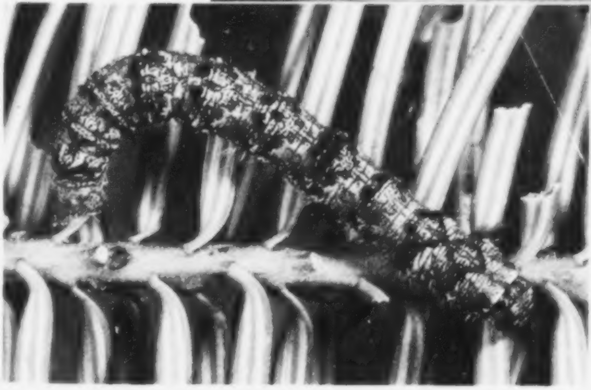
Dorsal view of early instar larva on Douglas-fir



Dorsal view of mid-instar larva on Douglas-fir



Dorsal view of penultimate-instar larva on Douglas-fir



Dorsal view of mature larva (dark form) on Douglas-fir

Stenoporpia pulmonaria albescens (Hulst)

Hosts: Principal hosts are Douglas-fir and western hemlock; other hosts include amabilis fir, grand fir, Sitka spruce, mountain hemlock and lodgepole pine.

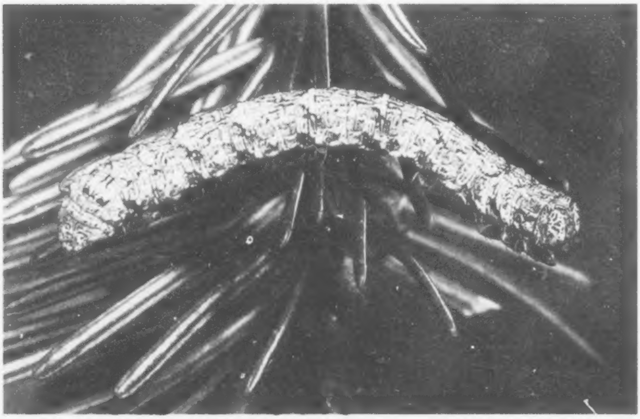
Distribution: Generally distributed throughout coastal British Columbia; north to southeast Alaska, and south to California.

Description: Mature larva up to 37 mm long. Head, slightly bi-lobed, light grey with black markings. Body, light grey; dark goblet-shaped middorsal markings. The color pattern of the mid-instar larva is unlike that of the mature larva.

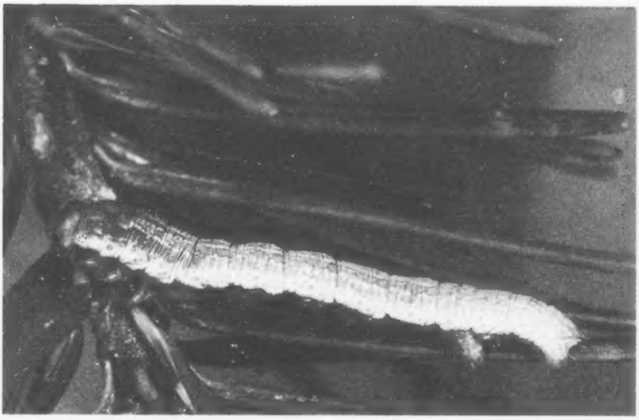
Bionomics: This species overwinters as a mid-instar larva. Larval feeding resumes in the spring and continues until June. Pupation occurs in June or July. Adults emerge from July to August, mate and lay eggs. Larvae emerge soon after and feed until the onset of cold weather.

Damage: *Stenoporpia pulmonaria albescens* is a common, innocuous, solitary defoliator.

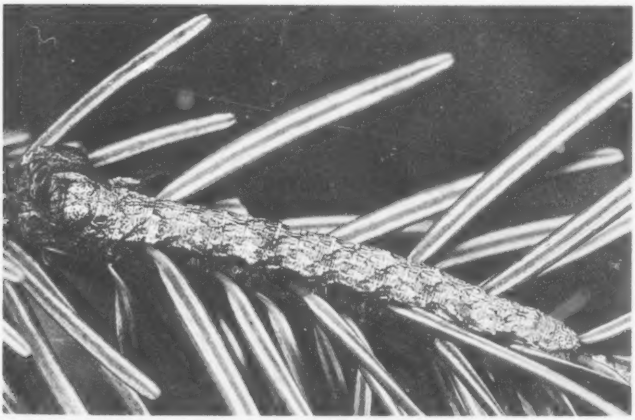
Similar species: *Stenoporpia excelsaria* (p. 154) and *S. p. satisfacta* (p. 158). *Stenoporpia p. albescens* differs from *S. excelsaria* in that its larval stage is completed in June rather than during the previous October. *Stenoporpia p. albescens* differs from *S. p. satisfacta* in that it has a coastal rather than an interior distribution.



Lateral view of mature larva on Douglas-fir



Lateral view of mid-instar larva on Douglas-fir



Dorso-lateral view of penultimate-instar larva on Douglas-fir

Stenoporpia pulmonaria satisfacta (Barnes & McDunnough)

Hosts: Principal host is Douglas-fir; other hosts include ponderosa pine and western hemlock.

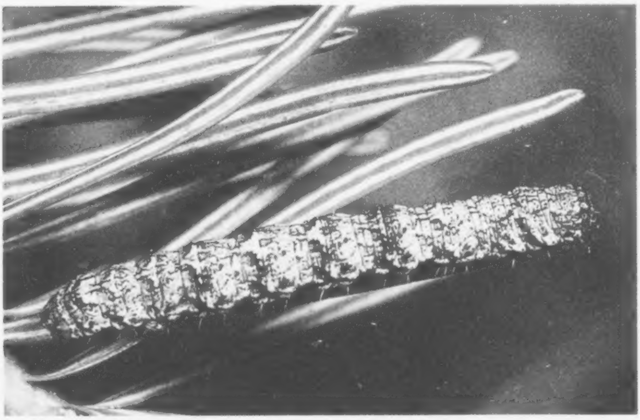
Distribution: Southern interior of British Columbia; south to California.

Description: Mature larva up to 35 mm long. Head, light grey with black markings. Body, light grey; dark goblet-shaped middorsal markings. The color pattern of the mid-instar larva is unlike that of the mature larva.

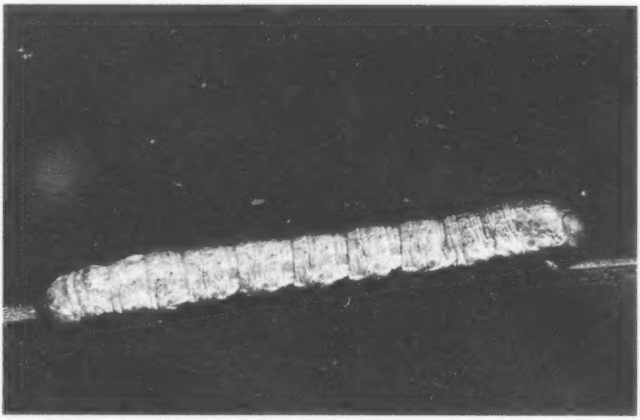
Bionomics: This species overwinters as a mid-instar larva. Larval feeding resumes in the spring and continues until June. Pupation occurs in June or July; adults emerge from July to August, mate and lay eggs. Larvae emerge soon after and feed until the onset of cold weather.

Damage: *Stenoporpia pulmonaria satisfacta* is a common, innocuous, solitary defoliator.

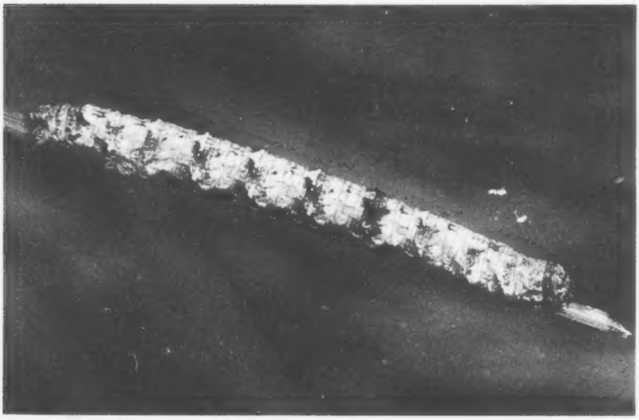
Similar species: *Stenoporpia excelsaria* (p. 154) and *S. p. albescens* (p. 156). *Stenoporpia p. satisfacta* differs from *S. excelsaria* in that its larval stage is completed in June rather than during the previous October. *Stenoporpia p. satisfacta* is found in the interior, whereas *S. p. albescens* is found on the coast.



Dorso-lateral view of mature larva on ponderosa pine



Dorso-lateral view of mid-instar larva on ponderosa pine



Dorso-lateral view of penultimate-instar larva on ponderosa pine

Synaxis pallulata Hulst

Hosts: Principal hosts are western hemlock and Douglas-fir; other hosts include western redcedar, amabilis fir, subalpine fir, grand fir, Engelmann spruce, white spruce, Sitka spruce, western larch and mountain hemlock.

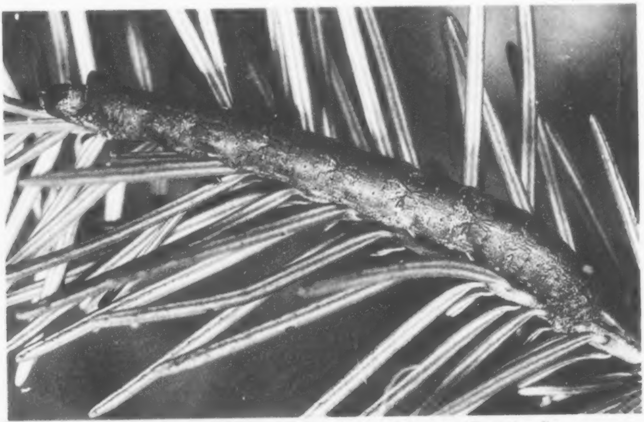
Distribution: Generally distributed throughout British Columbia from the Nass and upper Fraser River drainages south; east to mountainous western Alberta, and south to Utah and California.

Description: Mature larva up to 38 mm long. Twig mimic. Head, light brown with dark markings. Body, elongate; color, highly variable with a continuum of color forms ranging from yellowish cream to brownish grey to rusty brown. Body, variously marked. Second thoracic segment, swollen dorsally; paired tubercles near the posterior margin of the fourth, fifth and eighth abdominal segments.

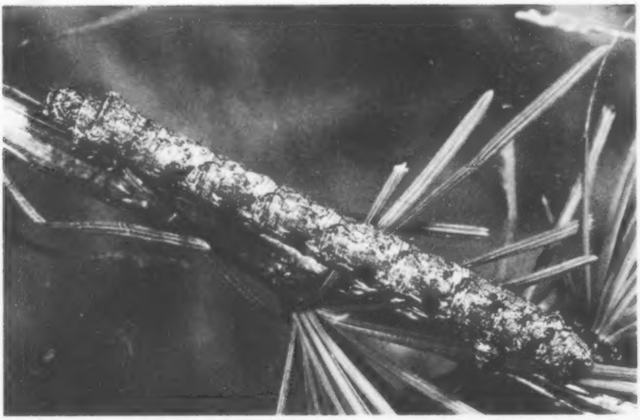
Bionomics: This species appears to overwinter in the egg stage. Larvae are present from June to August. Pupation occurs near the surface of the soil in August. Adults emerge August to September.

Damage: *Synaxis pallulata* is a common, innocuous, solitary defoliator.

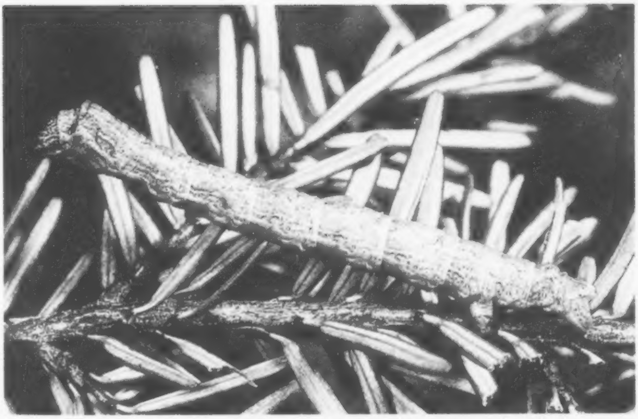
Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of mature larva (rusty brown form) on Douglas-fir



Dorso-lateral view of mature larva (brownish grey form) on western larch



Lateral view of mature larva (creamy yellow form) on western hemlock

Tetracis cachexiata (Guenée)

Hosts: Coniferous hosts include Douglas-fir, tamarack and white spruce; other hosts include white birch, trembling aspen and willow.

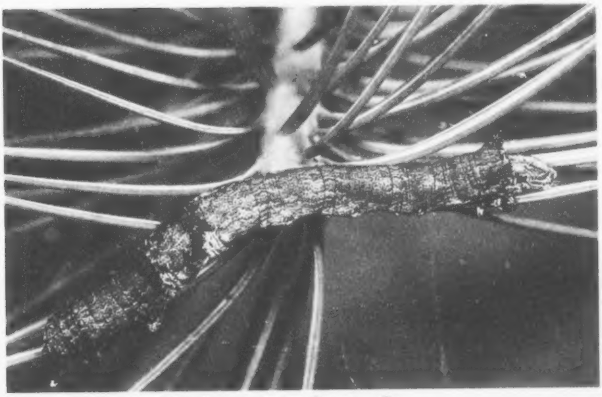
Distribution: Southern interior of British Columbia; east to Nova Scotia, and south to Florida, Texas and California.

Description: Mature larva up to 45 mm long. Head, small, flattened, dull yellowish white with dark markings. Body, slim, wider from segments 6 to 9, brown to grey and variously marked with repeating middorsal hourglass pattern. Second thoracic segment has a pair of large angular lateral swellings and small addorsal tubercles. Abdominal segments 4 and 5 each have a pair of subdorsal tubercles.

Bionomics: This species overwinters primarily in the pupal stage. Larvae are present from early June to August. Pupation occurs in August or September. Adults emerge in September or May.

Damage: *Tetracis cachexiata* is a relatively uncommon, solitary defoliator.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of mature larva on Douglas-fir

Thallophaga hyperborea (Hulst)

Hosts: Principal host is western hemlock; other hosts include Douglas-fir, Sitka spruce, Engelmann spruce, white spruce, western redcedar, amabilis fir, subalpine fir, grand fir and mountain hemlock.

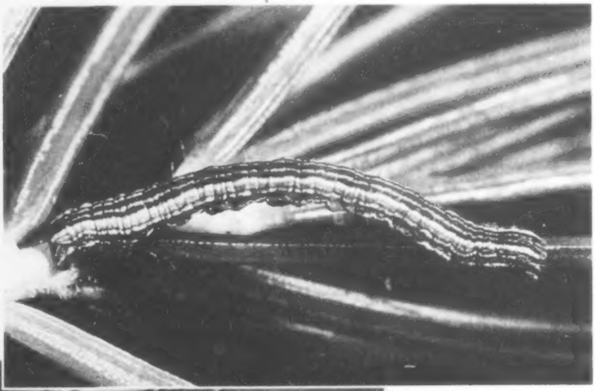
Distribution: Generally distributed throughout British Columbia south of the Nass and Peace River drainages; south to California.

Description: Mature larva up to 23 mm long. Head, brown with creamy yellow stripes from vertex to labrum. Body, orange–brown with faint tan stripes; creamy yellow subdorsal stripes extending onto head.

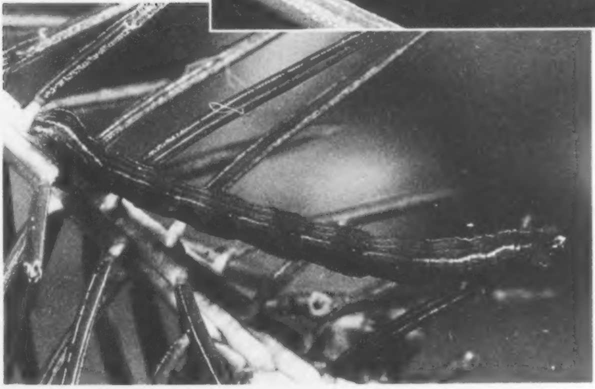
Bionomics: This species overwinters as a pupa buried in the soil. Adults emerge in April and May. Larvae are present from May to August, and pupation occurs in late summer.

Damage: *Thallophaga hyperborea* is a common, innocuous, solitary defoliator.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of early instar larva on Engelmann spruce



Dorso-lateral view of mature larva on Sitka spruce

Thera otisi Dyar

Hosts: Principal host is common juniper; also occurs on Rocky Mountain juniper.

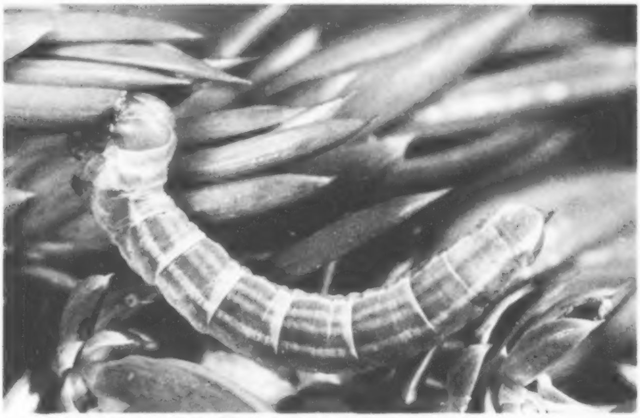
Distribution: Throughout the host range in the interior of British Columbia; east to Alberta, north to the Yukon, and south to Oregon and Colorado.

Description: Mature larva up to 16 mm long. Head, yellowish green, held under thorax. Body, green; 2 faint greenish white middorsal stripes; subdorsal stripe alternating white and yellow; white spiracular stripe; red supraspiracular stripe.

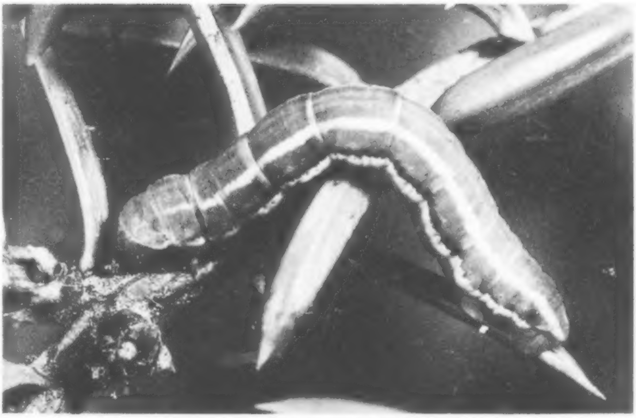
Bionomics: This species appears to overwinter in the egg stage. Larvae are present from June to July, pupation occurs in July, and adults emerge July to August.

Damage: *Thera otisi* is a rather uncommon, solitary defoliator.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of mid-instar larva feeding on common juniper



Dorso-lateral view of mature larva on common juniper

Tolype dayi (Blackmore)

Hosts: Principal hosts are Douglas-fir and ponderosa pine; other hosts include lodgepole pine and Engelmann spruce.

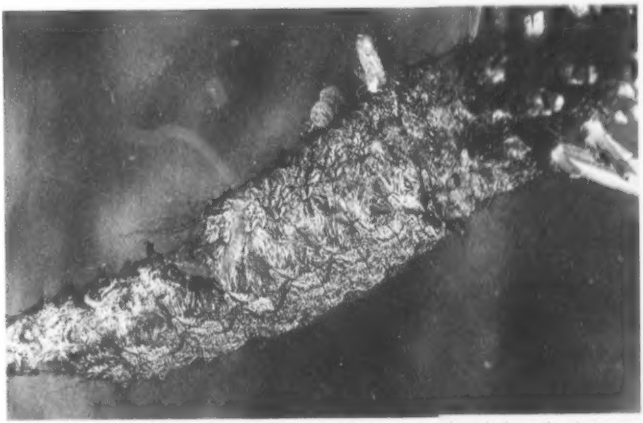
Distribution: Southern British Columbia; south to California.

Description: Mature larva up to 34 mm long. Head, grey with dark markings. Body, grey, covered with long fine grey or black hairs; midline of dorsum has dark diamond-like markings; transverse black and orange marking across dorsum of third thoracic segment; transverse black marking on dorsum of the fifth abdominal segment. Paired dorsal tubercles, with long hairs, on dorsum of each segment; hairy lobes along sides of body.

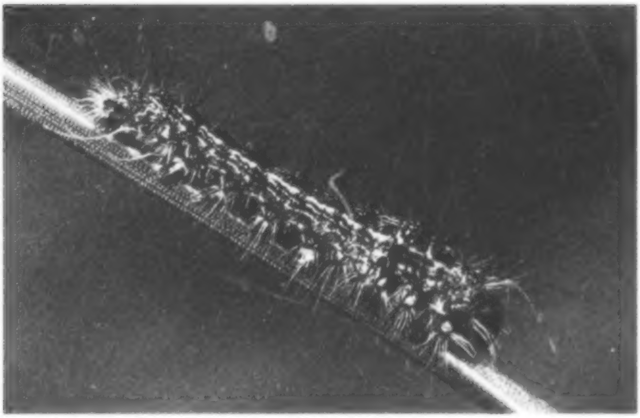
Bionomics: This species appears to overwinter in the egg stage. Larvae are present May to August. Pupation occurs in July or August, and adults emerge August to September.

Damage: *Tolype dayi* is a relatively uncommon, solitary defoliator.

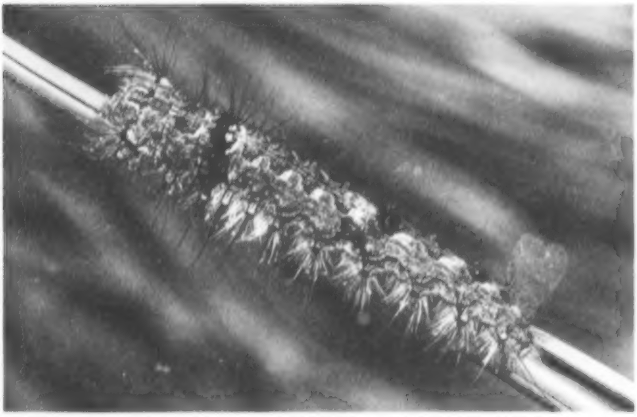
Similar species: No similar species occur on coniferous hosts in British Columbia.



Penultimate-instar larva (above) and mature larva (below) on lodgepole pine



Lateral view of early instar larva on ponderosa pine



Dorso-lateral view of mature larva on ponderosa pine

Callophrys eryphron (Boisduval)

Western pine elfin

Hosts: Principal host is lodgepole pine; other hosts include ponderosa pine and jack pine.

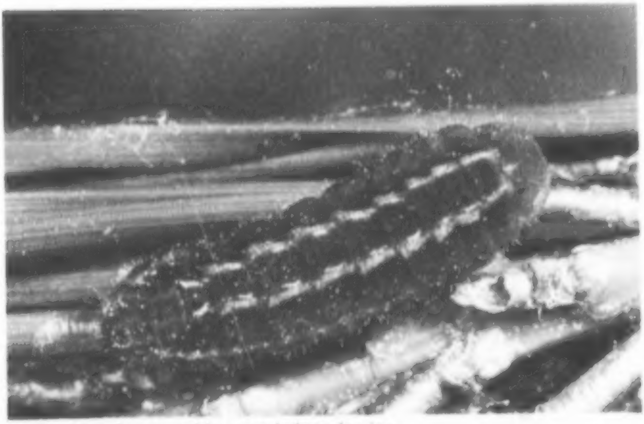
Distribution: Generally distributed throughout British Columbia; east to New Brunswick, north to Great Slave Lake, Northwest Territories, and south to California.

Description: Mature larva up to 15 mm long. Body and head, covered with short fine hairs. Head, green unmarked. Body, velvet green with cream to yellowish white subdorsal and subspiracular stripes. Prepupal larvae are bluish green, with red subdorsal and subspiracular stripes.

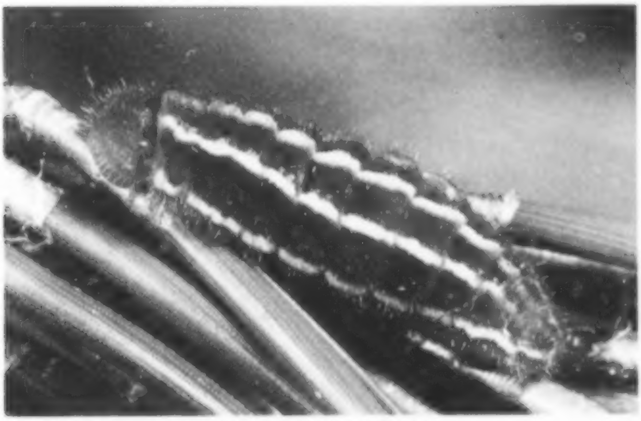
Bionomics: This species overwinters in the pupal stage. Adults emerge May to early June, and females lay eggs near branch tips. Larvae are present June to July. Pupation occurs in late July or August.

Damage: The western pine elfin is a rather uncommon, solitary defoliator.

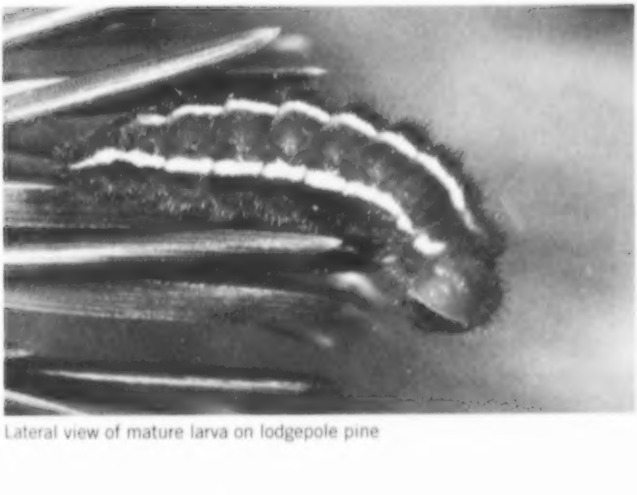
Similar species: *Callophrys g. barryi* (p. 170) and *C. g. rosneri* (p. 172) are similar, but occur on different hosts.



Dorsal view of prepupal larva on lodgepole pine



Dorso-lateral view of mature larva on lodgepole pine



Lateral view of mature larva on lodgepole pine

Callophrys grynea barryi (Johnson)
Barry's hairstreak

Host: Rocky Mountain juniper.

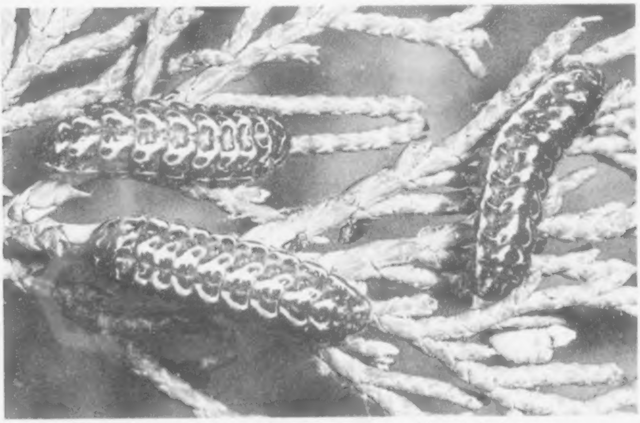
Distribution: Throughout the host range in British Columbia south of 53° latitude including Vancouver Island; south to Oregon.

Description: Mature larva up to 15 mm long. Body and head, covered with short fine hairs. Head, green unmarked; body, velvet green with cream to yellowish white key-shaped subdorsal markings on each segment; white subspiracular stripe. Prepupal larvae are bluish green, with pinkish cream subdorsal and subspiracular stripes.

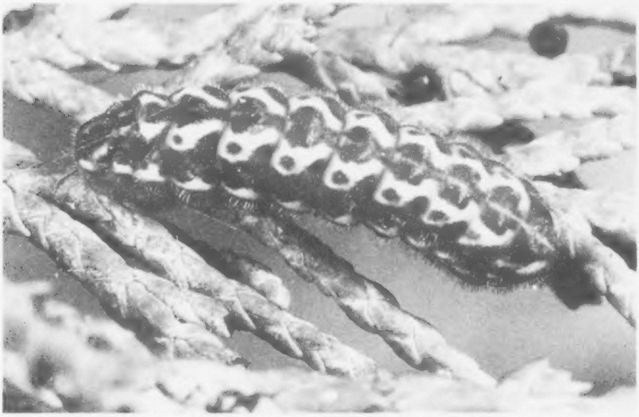
Bionomics: This species overwinters in the pupal stage. Adults emerge May to early June, and females lay eggs near branch tips. Larvae are present June to July, and pupation occurs in late July or August.

Damage: Barry's hairstreak is a rather uncommon, solitary defoliator.

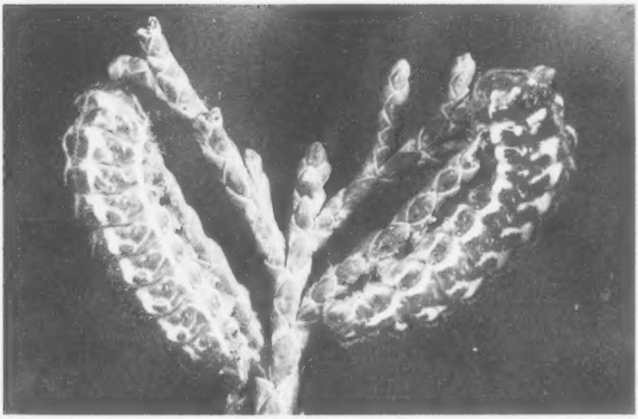
Similar species: *Callophrys g. rosneri* (p. 172) and *C. eryphron* (p. 168) are similar, but occur on different hosts.



Mature (left) and prepupal (right) larvae on Rocky Mountain juniper



Dorso-lateral view of mature larva on Rocky Mountain juniper



Mature larvae feeding on Rocky Mountain juniper

Callophrys grynea rosneri (Johnson)
Rosner's hairstreak

Host: Western redcedar.

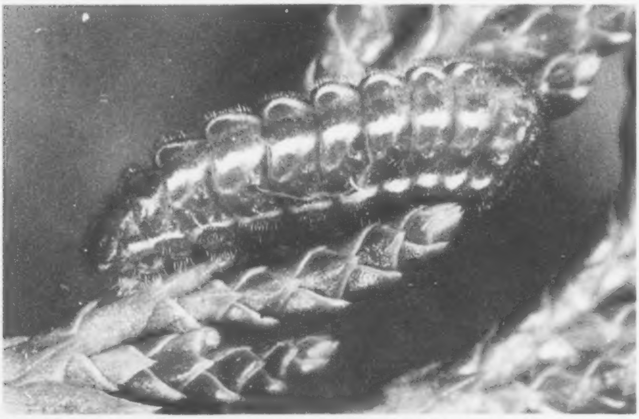
Distribution: Throughout the host range in southern British Columbia; south to Oregon.

Description: Mature larva up to 15 mm long. Body and head, covered with short fine hairs. Head, green unmarked. Body, velvet green, with cream to yellowish white subdorsal and subspiracular stripes. Prepupal larvae are bluish green, with pinkish cream subdorsal and subspiracular stripes.

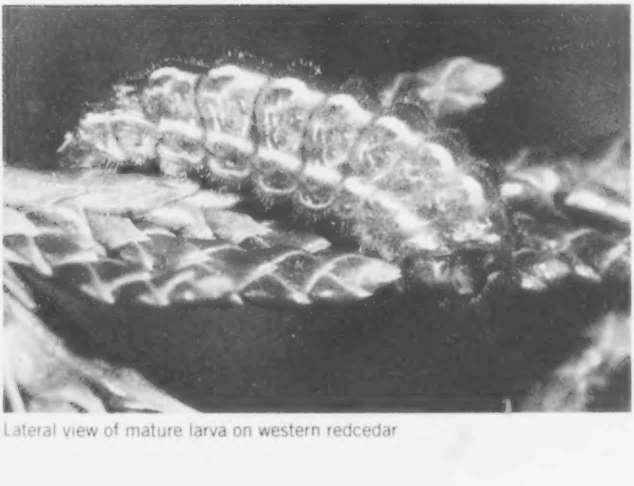
Bionomics: This species overwinters in the pupal stage. Adults emerge May to early June, and females lay eggs near branch tips. Larvae are present June to July, and pupation occurs in late July or August.

Damage: Rosner's hairstreak is a rare, solitary defoliator.

Similar species: *Callophrys g. barryi* (p. 170) and *C. eryphron* (p. 168) are similar, but occur on different hosts.



Dorso-lateral view of mature larva on western redcedar



Lateral view of mature larva on western redcedar

Dasychira grisefacta (Dyar)
Pine tussock moth

Hosts: Principal hosts are Douglas-fir, western hemlock, Engelmann spruce, white spruce and ponderosa pine; other hosts include subalpine fir, grand fir, western larch, western white pine and lodgepole pine.

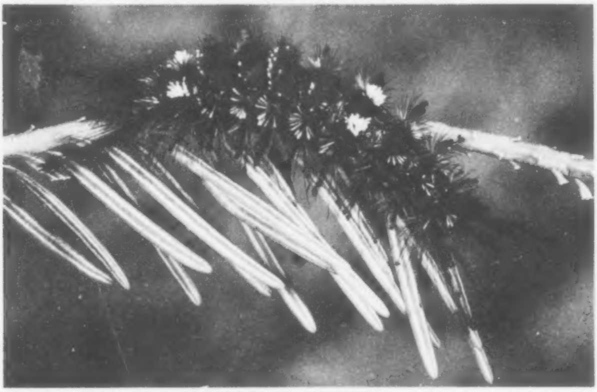
Distribution: Generally distributed throughout British Columbia; east to mountainous western Alberta, and south to California.

Description: Mature larva up to 35 mm long. Head, unmarked black. Body, covered with white or yellowish hairs that radiate from black tubercles; 4 middorsal tufts of greyish white to grey hairs on abdominal segments 1 to 4. Two long black pencil tufts project forward from the first thoracic segment, and 3 more project back from the rear of the body. Bright red eversible glands on the dorsum of abdominal segments 6 and 7.

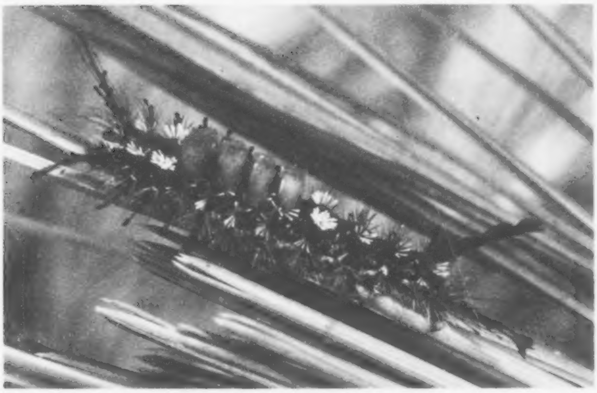
Bionomics: This species overwinters as early instar larvae under bark scales. Larval feeding resumes in spring and continues until July. Pupation occurs in July. Adults emerge late July to August, mate and lay eggs in small clusters on foliage. Larvae emerge soon after, feed briefly, and then hibernate.

Damage: The pine tussock moth is a relatively uncommon, solitary defoliator in British Columbia. This species, however, occasionally goes into outbreak on individual open-grown trees in urban settings. One outbreak covering 26 000 ha of young ponderosa pine stands was recorded in Montana in 1965.

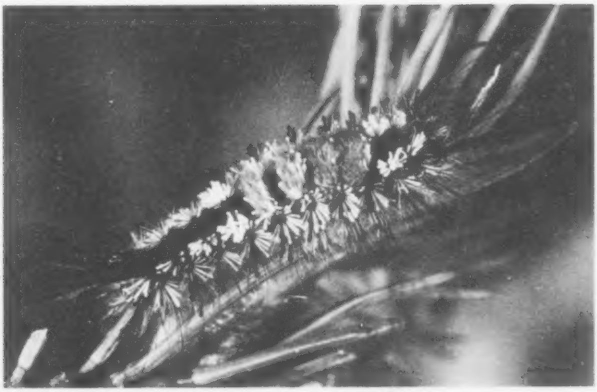
Similar species: *Orgyia* spp. (p. 176–178), *Panthea* spp. (p. 212–214) and *Lophocampa argentata* (p. 40) have larvae covered with long hairs arranged in prominent clusters or tufts. Although superficially similar to these species, the larva of *Dasychira grisefacta* can be distinguished by its distinctive color and arrangement of body hairs.



Dorso-lateral view of mature larva on Douglas-fir



Dorso-lateral view of mature larva on ponderosa pine



Dorso-lateral view of mature larva on Engelmann spruce

Orgyia antiqua (Linnaeus)
Rusty tussock moth

Hosts: The rusty tussock moth is a generalist feeder for which more than 50 coniferous and hardwood host species have been recorded. Principal coniferous hosts in British Columbia are Engelmann spruce, white spruce and lodgepole pine; other coniferous hosts include Sitka spruce, subalpine fir, western hemlock, western larch, western redcedar, eastern white-cedar and Douglas-fir.

Distribution: Holarctic. Generally distributed throughout British Columbia; east to Newfoundland, north to Alaska and the Yukon, south to Pennsylvania and California; Eurasia. The western North American subspecies *Orgyia antiqua badia* (Henry Edwards) occurs from British Columbia and the Yukon south to California.

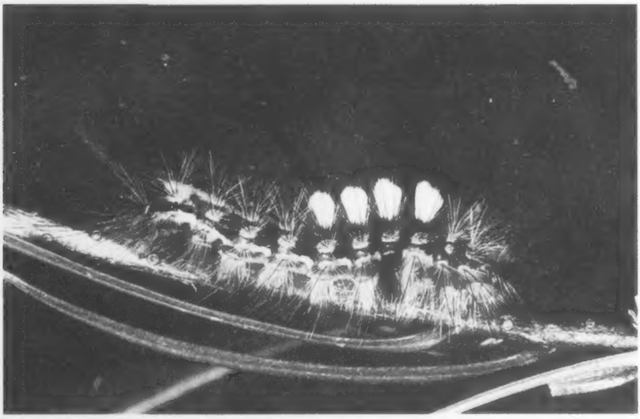
Description: Mature larva up to 30 mm long. Head, unmarked black. Body, covered with yellowish white hairs radiating from orange tubercles; middorsal tufts of white hairs on abdominal segments 1 to 4. Two long black pencil tufts project forward from the first thoracic segment, and a similar tuft projects back from the rear of the body. Orange eversible glands on the dorsum of abdominal segments 6 and 7. Exposure to the urticating hairs on tussock moth can cause tussockosis rash on some people.

Bionomics: This species overwinters in the egg stage. Larvae emerge in late May or early June, and feed until late July or August. They initially feed on the current year's foliage, causing it to turn brown. Later in the summer, they may feed on both current and older foliage. Defoliation occurs first in the upper crown, then in the outermost portions of the branches, and finally in the lower crown and farther back on the branches.

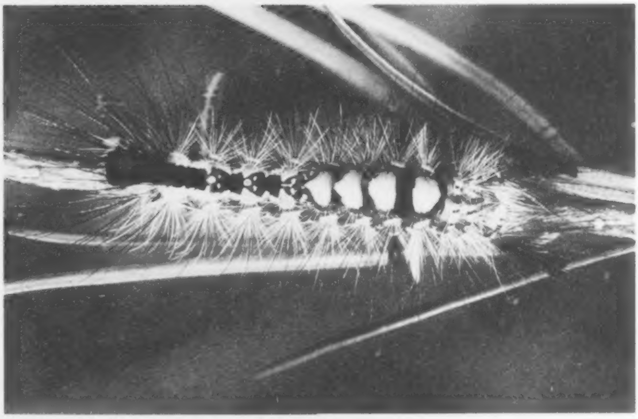
The mature larva pupates in late July or August within a cocoon on the foliage or trunk. Adults emerge 10 to 14 days later. After mating, the wingless female lays as many as 200 completely exposed eggs on the empty cocoon.

Damage: The rusty tussock moth is a common and occasionally damaging solitary defoliator. Localized, short-lived outbreaks have been recorded in the Monte Hills near Kamloops in 1975, and northeast of Prince George in 1992. Occasionally, localized outbreaks occur on individual or small groups of trees in urban settings, both on the south coast and in the southern interior.

Similar species: *Orgyia pseudotsugata* (p. 178), *Panthea* spp. (p. 212–214) and *Lophocampa argentata* (p. 40) have larvae that are covered with long hairs arranged in prominent clusters or tufts. Of these, *O. pseudotsugata* is most similar, but differs in that the eversible glands on the dorsum of segments 6 and 7 are red rather than orange and the anterior and posterior pencil tufts are about twice as long. The larva of *Orgyia antiqua* is easily distinguished from the larvae of the other 2 species by its distinctive color and arrangement of body hairs.



Lateral view of mature larva on Douglas-fir



Dorsal view of mature larva on Douglas-fir

Orgyia pseudotsugata (McDunnough)
Douglas-fir tussock moth

Hosts: Principal host is Douglas-fir. During outbreaks, adjacent ponderosa pine and western larch may also be attacked. Spruce grown as ornamentals, in seed orchards, or in Christmas tree plantations are occasionally damaged. In the United States, grand fir, subalpine fir and white fir are common hosts.

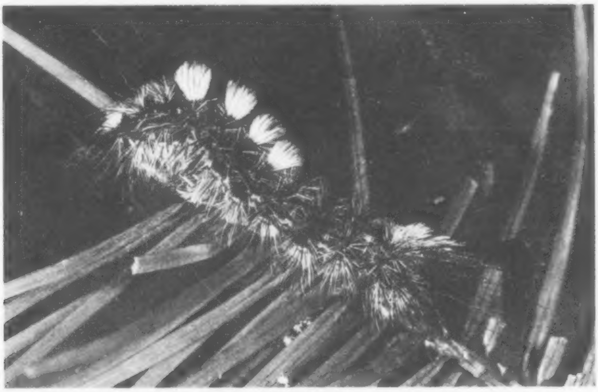
Distribution: Principally occurs in arid Douglas-fir and ponderosa pine forests in the Thompson, North Thompson, Okanagan, Similkameen and Kettle River valleys; also occurs along the east coast of Vancouver Island and in the lower Fraser River valley; south to California and New Mexico.

Description: Mature larva up to 30 mm long. Head, unmarked black. Body, covered with white hairs radiating from red tubercles; middorsal tufts of rust-tipped white hairs on abdominal segments 1 to 4. Two long black pencil tufts project forward from the first thoracic segment, and a similar tuft projects back from the rear of the body. Red eversible glands on the dorsum of abdominal segments 6 to 8. Exposure to the urticating hairs on tussock moth can cause tussockosis rash on some people.

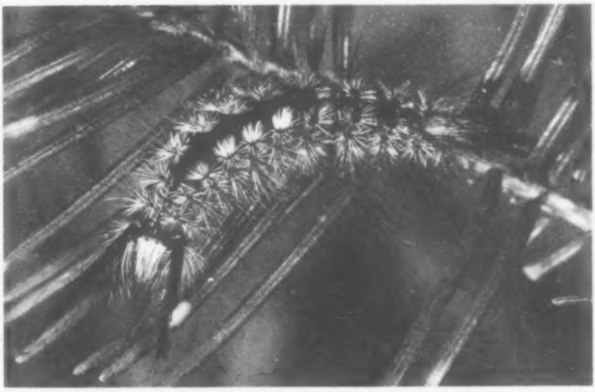
Bionomics: This species overwinters in the egg stage. Larvae emerge in late May or early June and feed until late July or August. They initially feed on the current year's foliage, causing it to turn brown. Later in the summer, they may feed on both current and older foliage. Defoliation occurs first in the upper crown, then in the outermost portions of the branches, and finally in the lower crown and farther back on the branches. The mature larva pupates in August within a cocoon on the foliage or trunk. Adults emerge 10 to 14 days later. After mating, the wingless female lays as many as 200 eggs on the empty cocoon. The egg mass is covered with hairs from the female's body.

Damage: The Douglas-fir tussock moth is a common and periodically destructive solitary defoliator. Repeated outbreaks (1918 to 1922, 1928 to 1931, 1946 to 1949, 1961 to 1964, 1970 to 1976, 1981 to 1985, and 1991 to 1993) have been recorded at various locations throughout the interior range of this insect in British Columbia. Occasionally, localized outbreaks occur on individual or small groups of Douglas-fir or spruce in urban settings, both on the coast and in the southern interior. Severe defoliation by the tussock moth may result in tree mortality or top kill, or may weaken trees, making them susceptible to bark beetle attack.

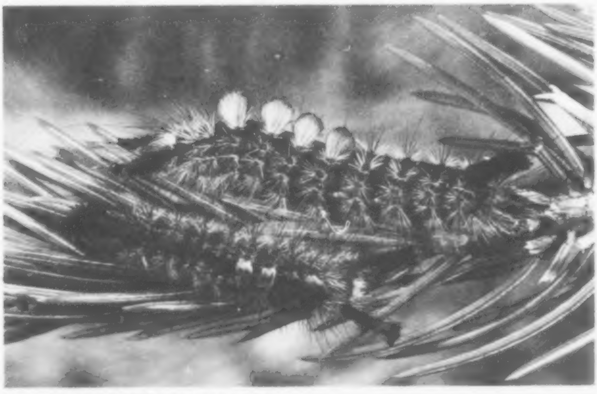
Similar species: *Orgyia antiqua* (p. 176), *Panthea* spp. (p. 212–214) and *Lophocampa argentata* (p. 40) have larvae that are covered with long hairs arranged in prominent clusters or tufts. Of these, *O. antiqua* is most similar, but differs in that the eversible glands on the dorsum of segments 6 and 7 are orange rather than red, and the anterior and posterior pencil tufts are about half as long. The larva of *Orgyia pseudotsugata* can easily be distinguished from the other 2 species by its distinctive color and arrangement of body hairs.



Lateral view of mature larva on Douglas-fir



Dorsal view of mature larva on Douglas-fir



Mature larvae on Engelmann spruce

Abagrotis mirabilis (Grote)

Host: Rocky Mountain juniper.

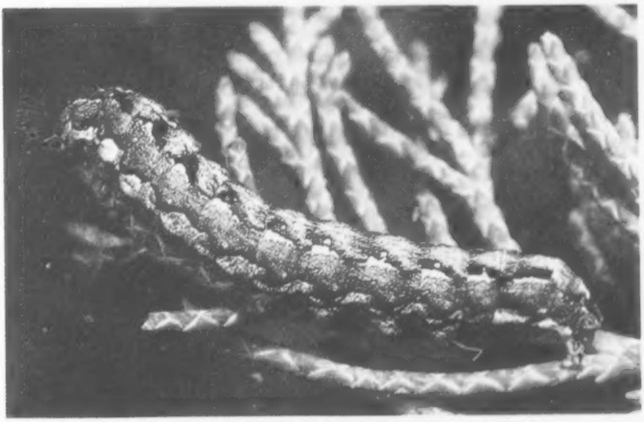
Distribution: Throughout the host range in the interior of British Columbia south of 51° latitude; south to California and Utah.

Description: Mature larva up to 32 mm long. This species has 2 distinct color pattern forms. The head of both forms is light yellowish brown with dark netting and a dark band over the vertex of each lobe. The body of the more common brown form has broken white middorsal, subdorsal and spiracular stripes, and paired brown, wedge-shaped subdorsal markings. The less common grey form has a similar pattern.

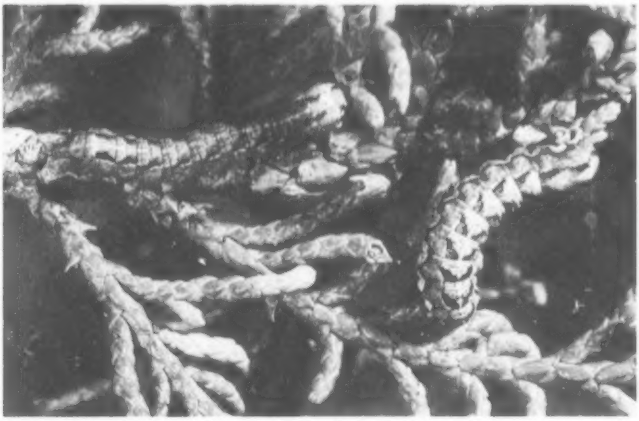
Bionomics: This species appears to overwinter as a mid-instar larva. Larvae are present late May to June, pupation occurs in late June, and adults emerge in mid-July.

Damage: *Abagrotis mirabilis* is a rather uncommon, solitary defoliator.

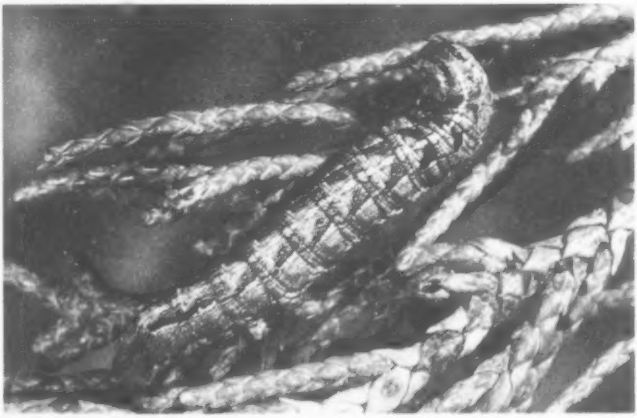
Similar species: Although a larva of *Abagrotis turbulenta* McDunnough (Rocky Mountain juniper is the probable host) was not collected during this study, it is likely to be similar to *A. mirabilis*. Of the two, *A. turbulenta* appears to be much less common in British Columbia.



Lateral view of mature larva (grey form) on Rocky Mountain juniper



Mid-instar larvae (brown form, left; grey form, right) on Rocky Mountain juniper



Dorso-lateral view of mature larva (brown form) on Rocky Mountain juniper

Abagrotis new sp.

Host: Ponderosa pine.

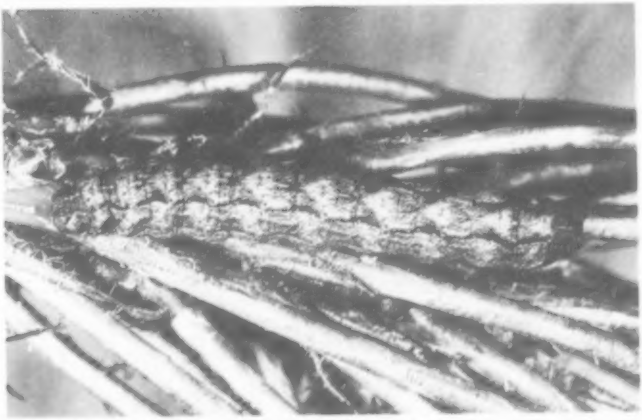
Distribution: Throughout the host range in the southern interior of British Columbia; south to Colorado and west Texas.

Description: Mature larva up to 36 mm long. Head, light tan with dark netting and a dark band over the vertex of each lobe. Body, light grey; broken white middorsal and subdorsal stripes; paired black, wedge-shaped subdorsal markings.

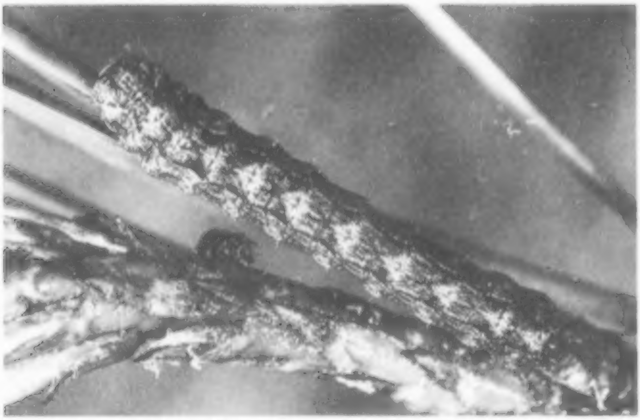
Bionomics: This species appears to overwinter as a mid-instar larva. Larvae are present late May to June, pupation occurs in late June, and adults emerge in mid-July.

Damage: *Abagrotis* new sp. is an uncommon, solitary defoliator.

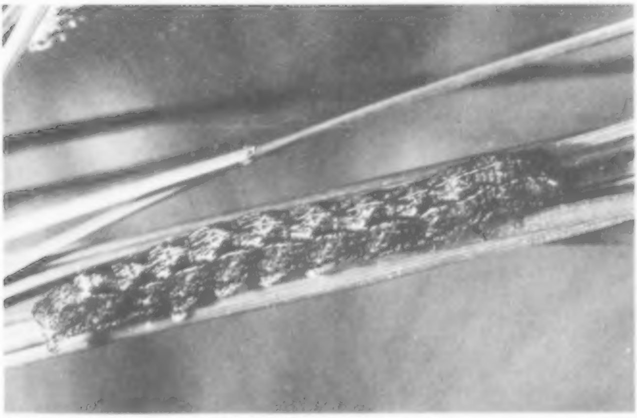
Similar species: No similar species occur on ponderosa pine in British Columbia.



Dorso-lateral view of mature larva on ponderosa pine



Dorsal view of mid-instar larva on ponderosa pine



Dorso-lateral view of mid-instar larva on ponderosa pine

Abagrotis pulchrata Blackmore

Hosts: Douglas-fir is the only known host in British Columbia.

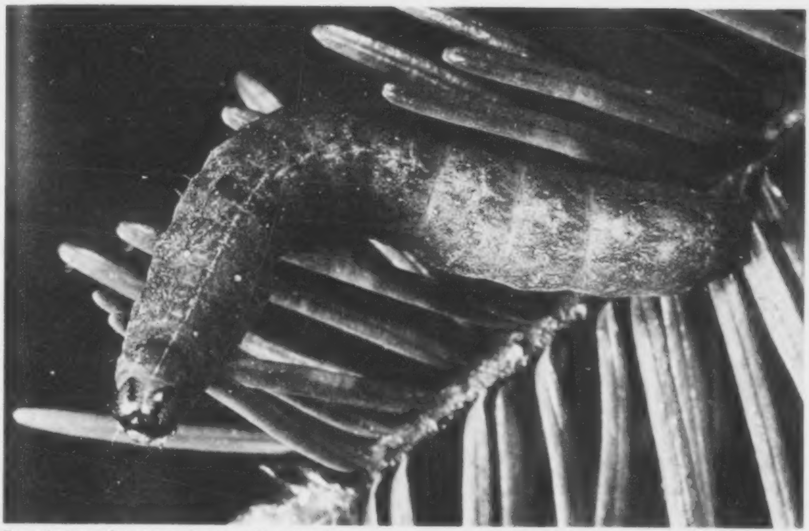
Distribution: South coastal British Columbia; south to California.

Description: Mature larva up to 40 mm long. Head, light tan with dark netting and dark band over the vertex of each lobe. Body, pinkish brown; yellowish cream middorsal line; prominent curved black dorsal saddle marking on first abdominal segment.

Bionomics: This species overwinters as a mid-instar larva. Larvae are present April to May, pupation occurs in June, and adults emerge July to August.

Damage: *Abagrotis pulchrata* is a rare solitary defoliator.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorsal view of mature larva on Douglas-fir

Cosmia praeacuta (Smith)

Hosts: Principal host is Douglas-fir; other hosts include western hemlock, amabilis fir, grand fir, subalpine fir and Engelmann spruce.

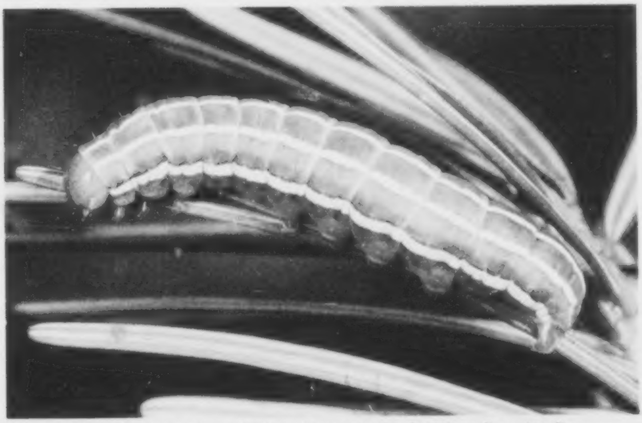
Distribution: Generally distributed throughout British Columbia from the Skeena and upper Fraser River drainages south; east to mountainous western Alberta, south to California and Arizona.

Description: Mature larva up to 25 mm long. Head, unmarked green. Body, green with prominent white middorsal and subdorsal stripes. Subspiracular stripe, white or occasionally yellow, with dark green margin above.

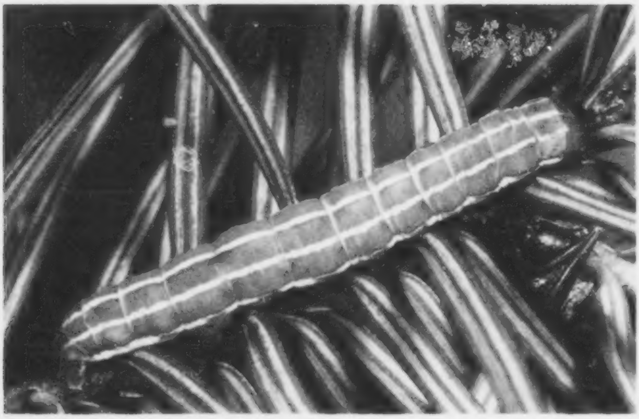
Bionomics: This species overwinters as an early instar larva. Larvae are present mid-May to early July, pupation occurs in late June or early July, and adults emerge in July.

Damage: *Cosmia praeacuta* is a relatively common, innocuous, solitary defoliator.

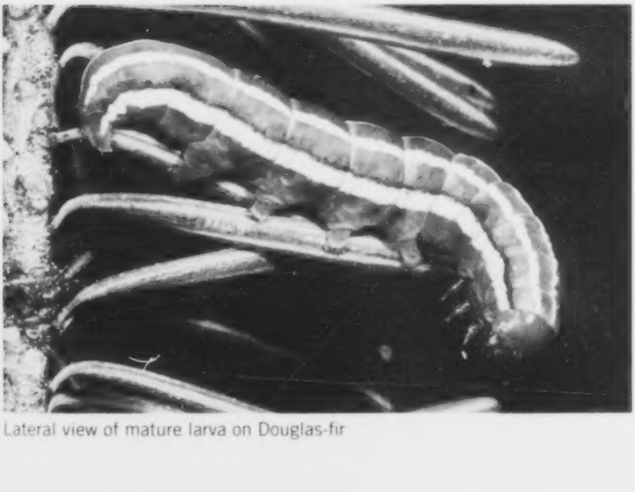
Similar species: Although a larva of *Cosmia elisae* Lafontaine & Troubridge was not collected during this study, it is likely to be similar to *C. praeacuta*. Of the two, *C. elisae* appears to be much less common in British Columbia.



Lateral view of mature larva (yellow lateral stripe form) on Douglas-fir



Dorso-lateral view of mature larva on Douglas-fir



Lateral view of mature larva on Douglas-fir

Egira curialis (Grote)

Hosts: Principal coniferous host is Douglas-fir; also occurs on lodgepole pine. Nonconiferous hosts include willow, cherry and other hardwoods.

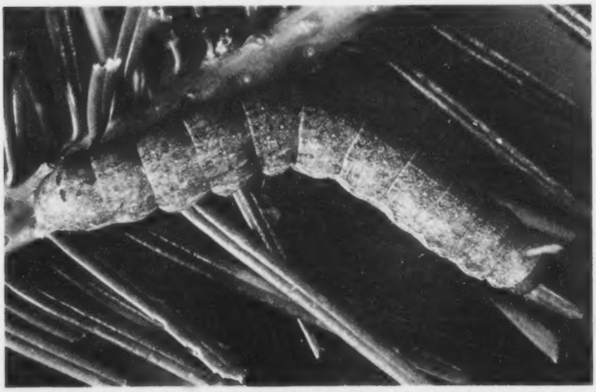
Distribution: Southern British Columbia; south to California.

Description: Mature larva up to 38 mm long. This species has several color forms. The more common brown form has a creamy brown head with black bars on the vertices and black netting. The body is brown with broken, greyish middorsal and subdorsal stripes and a broad brownish white spiracular stripe. A less common green form has a green head with black spots. The body is green, with thin white middorsal and subdorsal stripes and a broad greenish white spiracular stripe. An intermediate greyish green form also occurs. Early instar larvae of all color forms resemble the color pattern of the green form.

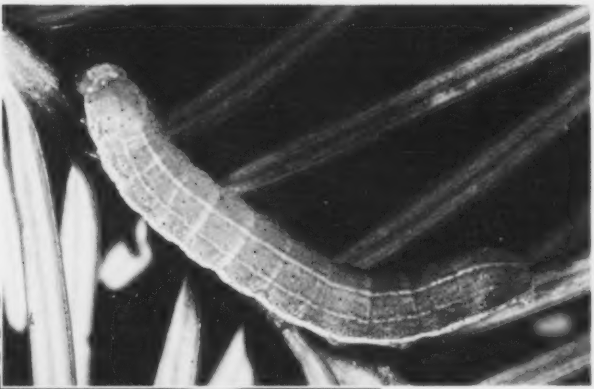
Bionomics: This species overwinters as a pupa buried in the duff. Adults emerge April to May. Larvae are present May to July, and pupation occurs in July or August.

Damage: *Egira curialis* is a rather uncommon, solitary defoliator.

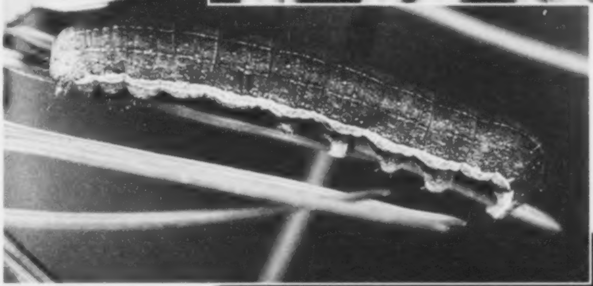
Similar species: *Egira perlubens* (p. 192). *Egira curialis* can be distinguished from *E. perlubens* by its more clearly defined spiracular stripe.



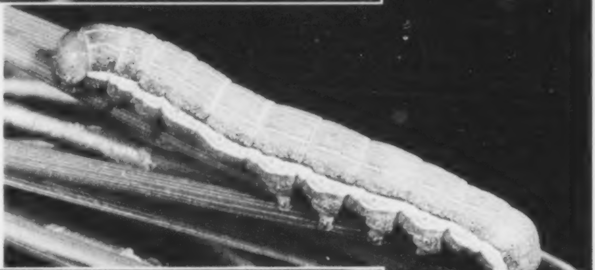
Dorso-lateral view of prepupal larva (brown form) on ponderosa pine



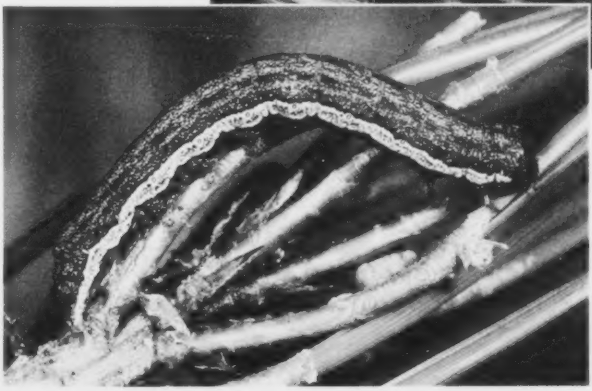
Dorso-lateral view of early instar larva on Douglas-fir



Dorso-lateral view of mid-instar larva, on Douglas-fir



Lateral view of mature larva (green form) on ponderosa pine



Lateral view of mature larva (brown form) on ponderosa pine

Egira hiemalis (Grote)

Hosts: Principal host is Douglas-fir; also occurs on lodgepole pine and Engelmann spruce.

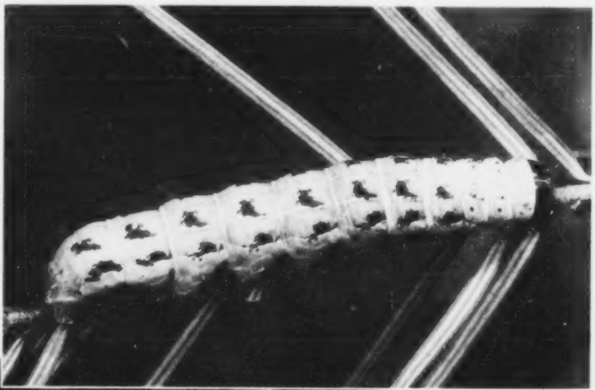
Distribution: Generally distributed throughout the range of the principal host in southern British Columbia; south to California.

Description: Mature larva up to 32 mm long. Head, reddish brown with a black band over each lobe. Body color, variable from greyish green to purplish green to brown; narrow white middorsal, subdorsal and subspiracular lines. Prominent black dorsal and lateral patches on each abdominal segment.

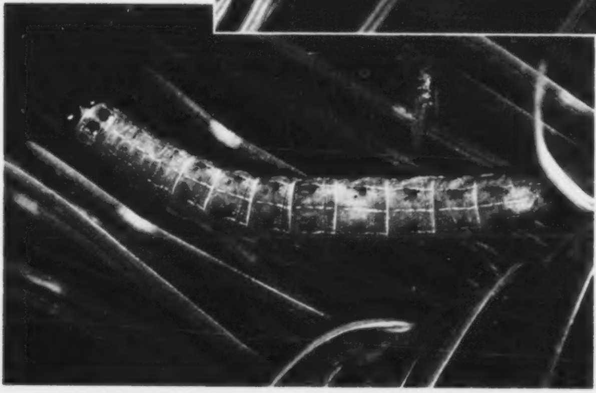
Bionomics: This species overwinters as a pupa buried in the duff. Adults emerge April to May. Larvae are present June to July, and pupation occurs in July or August.

Damage: *Egira hiemalis* is a common, innocuous, solitary defoliator.

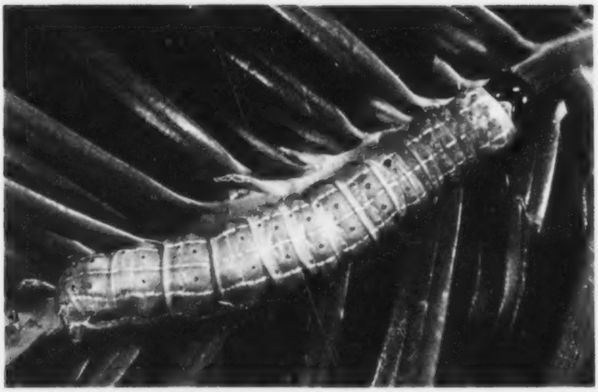
Similar species: No similar species occur on coniferous hosts in British Columbia.



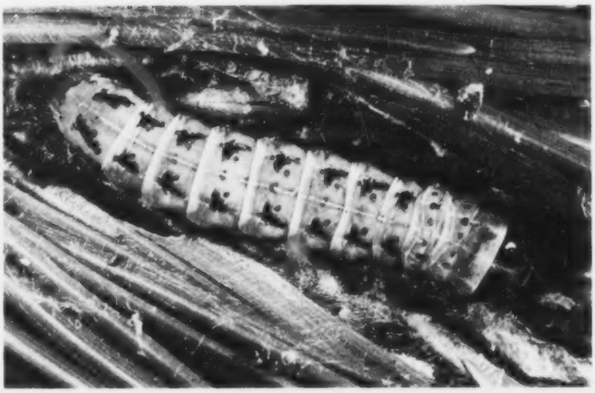
Dorso-lateral view of mature larva (greyish green form) on Douglas-fir



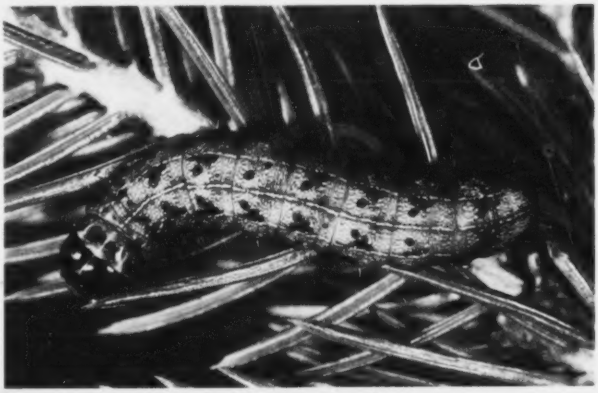
Dorsal view of mature larva (purplish form) on Douglas-fir



Dorsal view of mid-instar larva on Douglas-fir



Dorsal view of mature larva (green form) on lodgepole pine



Dorsal view of mature larva (brown form) on Engelmann spruce

Egira perlubens (Grote)

Hosts: Principal coniferous host is Douglas-fir; other coniferous hosts include western hemlock and grand fir. Nonconiferous hosts include willow and alder.

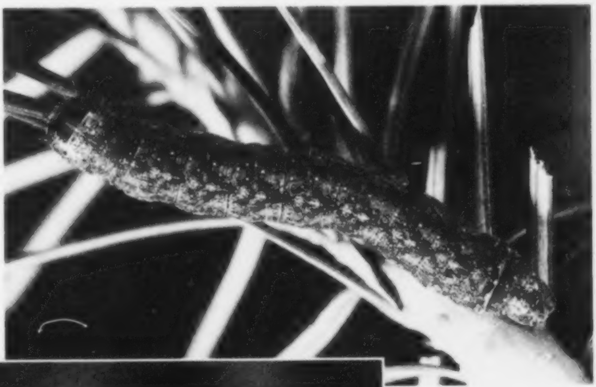
Distribution: Southern British Columbia; south to California.

Description: Mature larva up to 35 mm long. Head, yellowish brown with black netting and a black band over the vertex of each lobe. Body, rusty brown with fine grey middorsal and subdorsal lines; narrow white supraspiracular stripe with broad rusty cream-colored spiracular stripe below. Paired transverse black markings on dorsum of eighth abdominal segment.

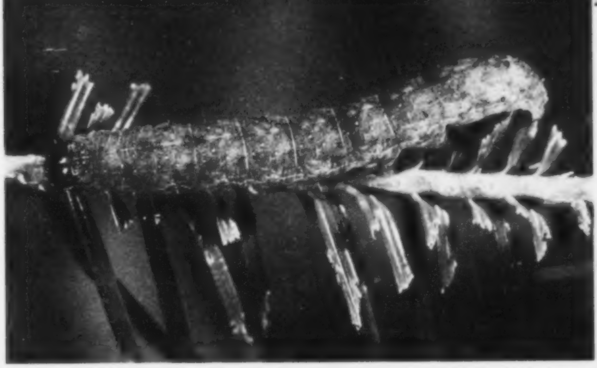
Bionomics: This species overwinters as a pupa buried in the duff. Adults emerge April to May. Larvae are present June to July, and pupation occurs in July or August.

Damage: *Egira perlubens* is a rather uncommon, solitary defoliator.

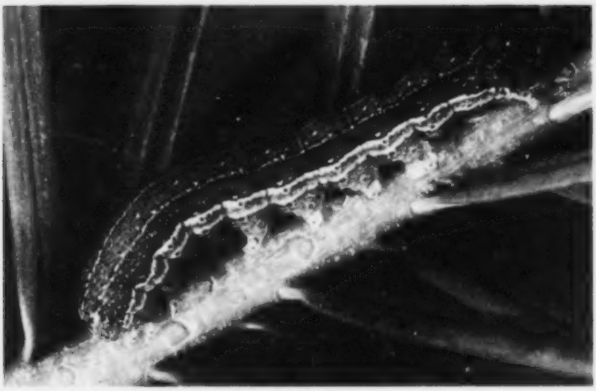
Similar species: *Egira curialis* (p. 188). *Egira perlubens* can be distinguished from *E. curialis* by its less clearly defined spiracular stripe.



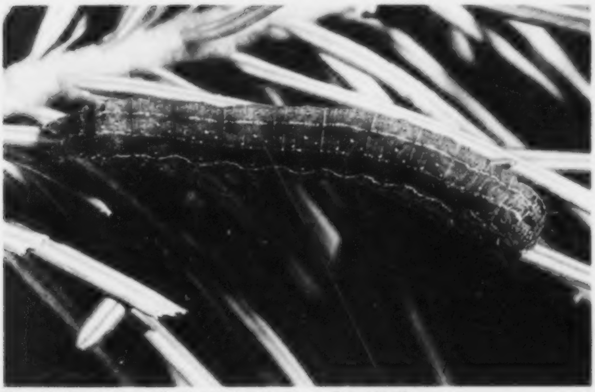
Dorsal view of mature larva on Douglas-fir



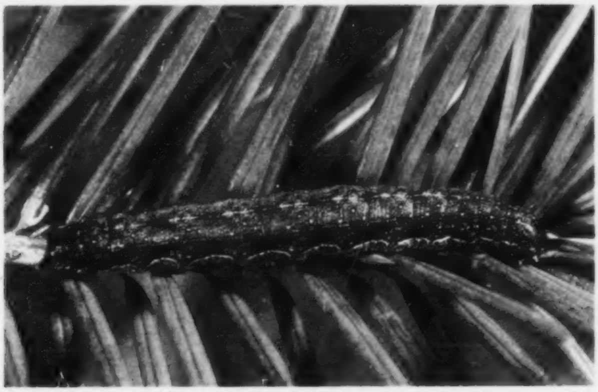
Dorso-lateral view of prepupal larva on Douglas-fir



Lateral view of early instar larva on Douglas-fir



Dorso-lateral view of mid-instar larva on Douglas-fir



Dorso-lateral view of penultimate-instar larva on Douglas-fir

Egira simplex (Walker)

Hosts: Coniferous hosts include Sitka spruce, Douglas-fir and grand fir; hardwood hosts include red alder and willow.

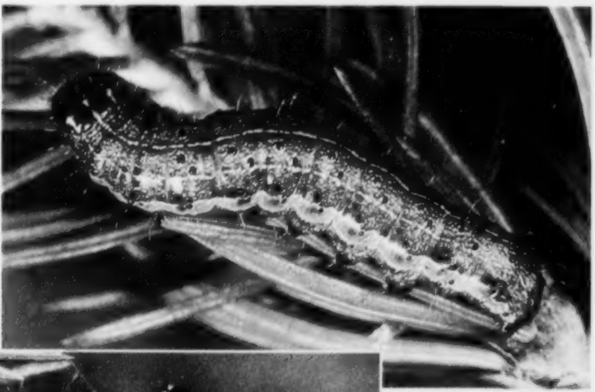
Distribution: Southern British Columbia; south to California and New Mexico.

Description: Mature larva up to 30 mm long. Head, black unmarked. Body, greyish brown with faint white mottling; distinct paired black addorsal spots; white middorsal and subdorsal lines; broad orange-brown spiracular stripe.

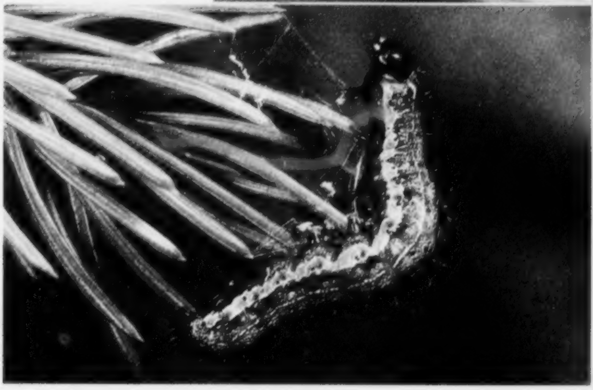
Bionomics: This species overwinters as a pupa buried in the duff. Adults emerge April to May. Larvae feed initially in the opening buds, then on new foliage, from May to mid-July. Pupation occurs in July.

Damage: *Egira simplex* is not frequently encountered on coniferous hosts. It does, however, occasionally occur on conifers in destructive numbers. A localized outbreak was recorded on Sitka spruce near Tofino in 1995.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of mature larva on Sitka spruce



Lateral view of mature larva on Sitka spruce

Eurois occulta (Linnaeus)

Hosts: Principal coniferous hosts are western redcedar, eastern white-cedar and tamarack; other hosts include snowberry, blueberry and sweet gale.

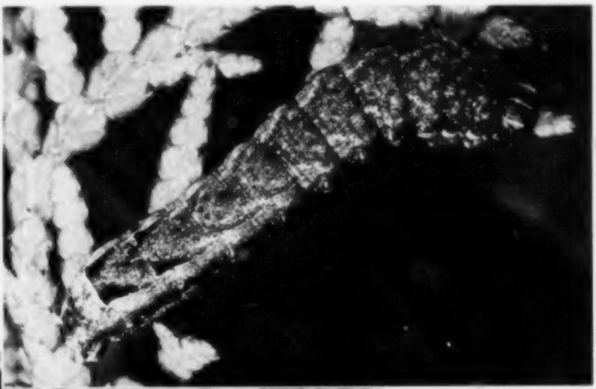
Distribution: Holarctic. Throughout British Columbia; it also occurs throughout much of North America south to New Jersey and Colorado; Greenland, Europe and across Siberia to China and Japan.

Description: Mature larva up to 35 mm long. Head, creamy yellow with dark reticulation and a black band over the vertex of each lobe. Body, yellowish brown; wedge-shaped subdorsal markings on abdominal segments 7 and 8. Thin yellow spiracular stripe with broad brownish cream subspiracular stripe below.

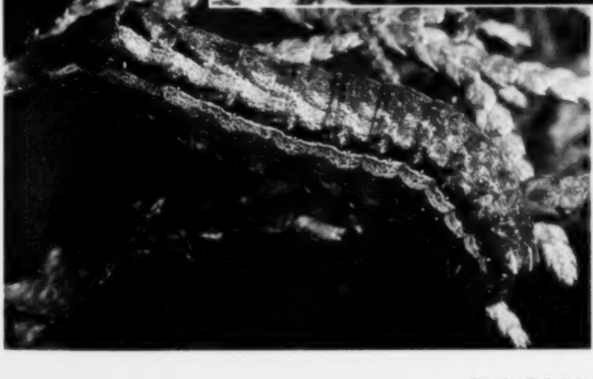
Bionomics: This species overwinters as a mid-instar larva. Larvae are present from April to June, pupation occurs in June or July, and adults emerge in July.

Damage: *Eurois occulta* is a relatively uncommon, solitary defoliator.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorsal view of mature larva on eastern white-cedar



Lateral view of mature larva on eastern white-cedar

Feralia comstocki (Grote)

Hosts: Principal host is Douglas-fir; other hosts include western hemlock, subalpine fir, Engelmann spruce and white spruce.

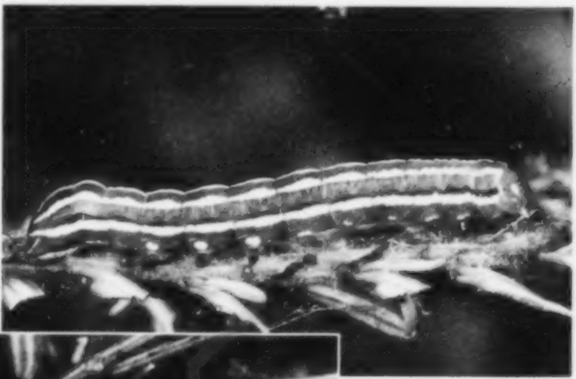
Distribution: Generally distributed throughout the interior of British Columbia from the Nass and Peace River drainages south; east to Nova Scotia, and south to North Carolina and Oregon.

Description: Mature larva up to 30 mm long. Head, pale green, unmarked. Body, green with bright white middorsal and subdorsal stripes; spiracular stripe alternating white and yellow, fringed above with red; oval yellowish green subspiracular markings above abdominal prolegs.

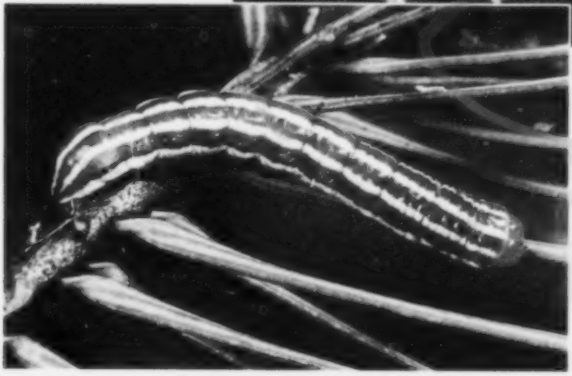
Bionomics: This species overwinters in the pupal stage. Adults emerge May to June. Larvae are present June to August. Pupation occurs in August.

Damage: *Feralia comstocki* is a common, innocuous, solitary defoliator.

Similar species: *Feralia jocosa* (p. 198) and *F. deceptiva* (p. 197). *Feralia comstocki* differs from both *F. jocosa* and *F. deceptiva* in that its spiracular stripe is continuous rather than broken into discrete oval segments.



Lateral view of mature larva on western hemlock



Dorso-lateral view of mature larva on Douglas-fir

Feralia deceptiva McDunnough

Host: Douglas-fir.

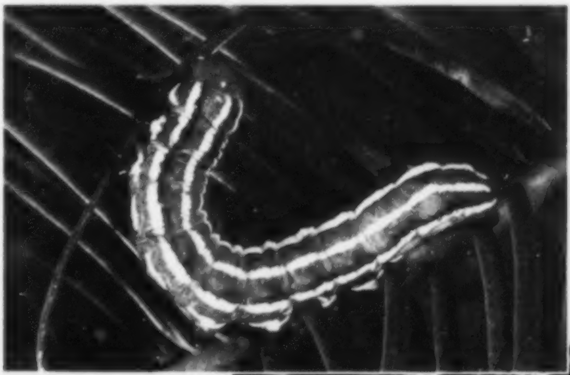
Distribution: Throughout the host range on the south coast of British Columbia; south to California.

Description: Mature larva up to 36 mm long. Body, green with bright white middorsal and subdorsal stripes; spiracular stripe, broken into discrete white, yellow and red oval segments; linear yellow subspiracular markings above abdominal prolegs.

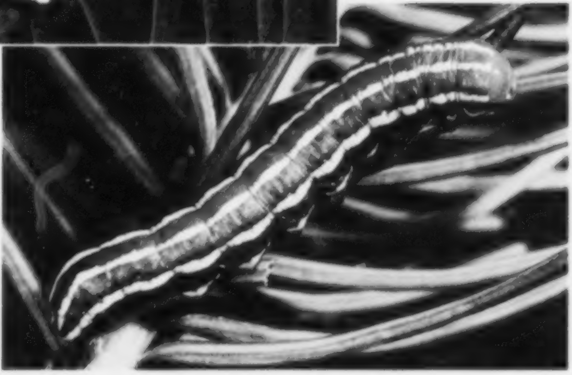
Bionomics: This species overwinters in the pupal stage. Adults emerge March to April. Larvae are present April to July, and pupation occurs in July or August.

Damage: *Feralia deceptiva* is a common, innocuous, solitary defoliator.

Similar species: *Feralia jocosa* (p. 198) and *F. comstocki* (p. 196). *Feralia deceptiva* can be distinguished from both of these species by its coastal distribution and larger size.



Lateral view of penultimate-instar larva, feeding on Douglas-fir



Lateral view of mature larva on Douglas-fir

Feralia jocosa (Guenée)
Redlined conifer caterpillar

Hosts: Principal hosts are western hemlock and Douglas-fir; other hosts include subalpine fir, amabilis fir, grand fir, Engelmann spruce, white spruce, Sitka spruce, black spruce, western larch, tamarack and mountain hemlock.

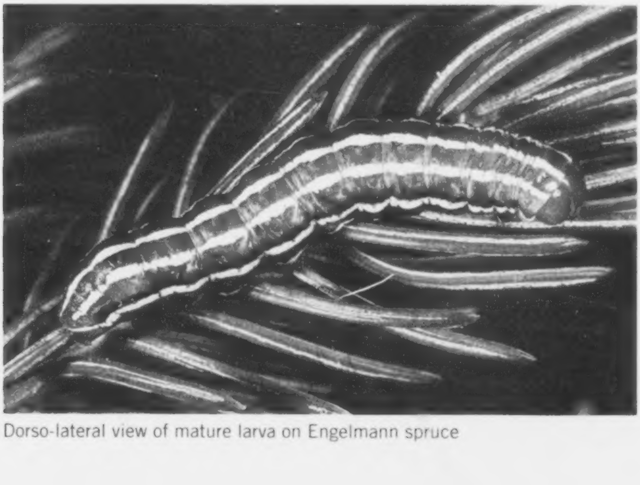
Distribution: Generally distributed throughout the interior of British Columbia from the Nass and Peace River drainages south; east to Nova Scotia and Newfoundland, and south to Pennsylvania and Oregon.

Description: Mature larva up to 30 mm long. Body, green with bright white middorsal and subdorsal stripes; spiracular stripe is broken into discrete white, yellow and red oval segments; linear yellow subspiracular markings above abdominal prolegs.

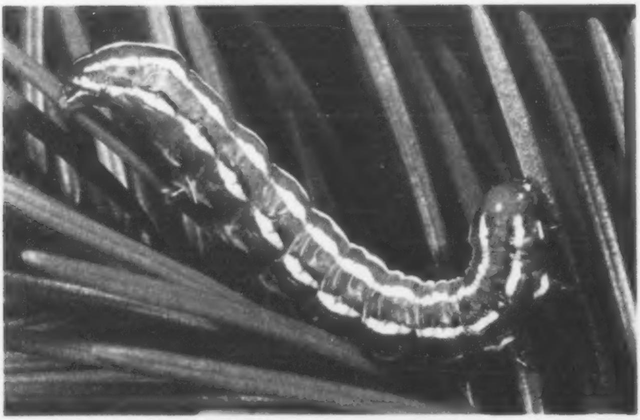
Bionomics: This species overwinters in the pupal stage. Adults emerge May to June. Larvae are present June to August, and pupation occurs in August.

Damage: The redlined conifer caterpillar is a common, innocuous, solitary defoliator.

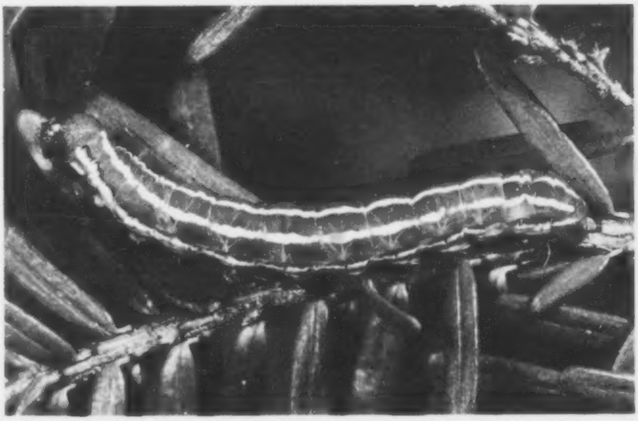
Similar species: *Feralia deceptiva* (p. 197) and *F. comstocki* (p. 196). *Feralia jocosa* is most similar to *F. deceptiva*, but can be distinguished from it by its smaller size and different distribution. *Feralia jocosa* differs from *F. comstocki* in that its spiracular stripe is broken into discrete oval segments rather than being continuous.



Dorso-lateral view of mature larva on Engelmann spruce



Lateral view of mature larva on Douglas-fir



Dorso-lateral view of mature larva on western hemlock

Lithophane atara (J.B. Smith)

Host: Ponderosa pine.

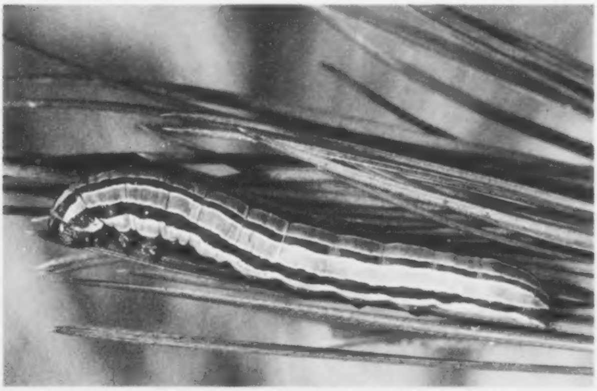
Distribution: South and central Okanagan valley of British Columbia; south to California, and east to Nebraska.

Description: Mature larva up to 48 mm long. Head, light yellow with red netting. Body, green with prominent white-margined red subdorsal and spiracular stripes. Broken red stripe above thoracic legs and abdominal prolegs.

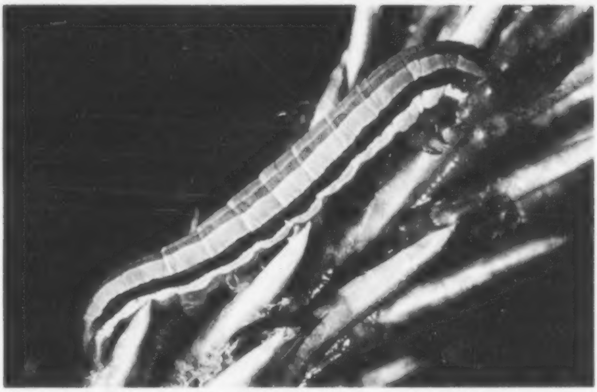
Bionomics: This species overwinters in the adult stage and becomes active in the early spring and occasionally on mild winter days. Larvae are present May to June, pupation occurs in July, and adults emerge August to September.

Damage: *Lithophane atara* is an uncommon, solitary defoliator.

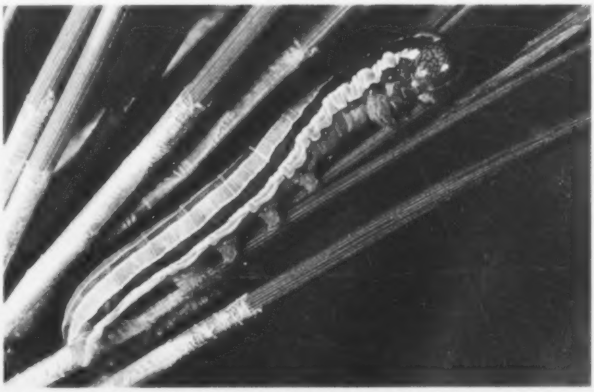
Similar species: No similar species occur on coniferous hosts in British Columbia.



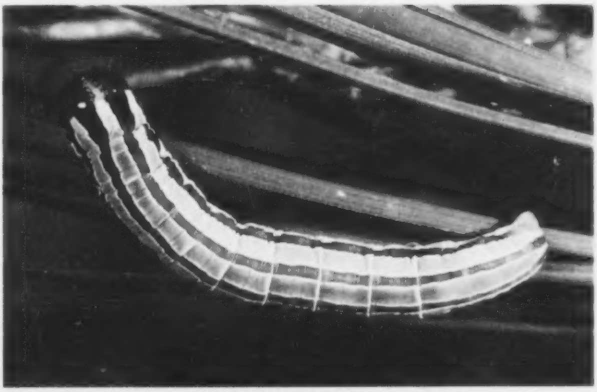
Dorso-lateral view of mature larva feeding on ponderosa pine



Lateral view of mid-instar larva feeding on ponderosa pine



Lateral view of penultimate-instar larva feeding on ponderosa pine



Dorsal view of penultimate-instar larva on ponderosa pine

Lithophane innominata (J.B. Smith)

Hosts: Principal coniferous hosts in British Columbia are Engelmann spruce and Sitka spruce; also occurs on alder, birch and willow.

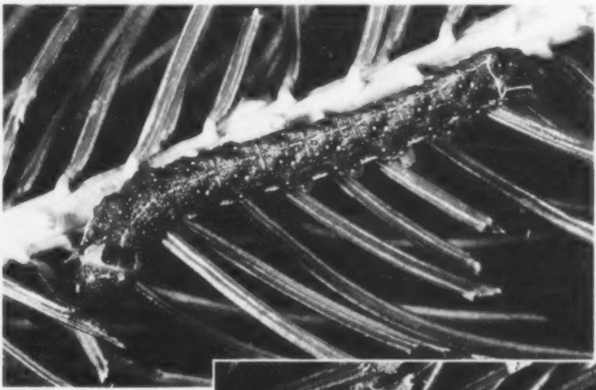
Distribution: Generally distributed throughout British Columbia from the Nass and upper Fraser River drainages south; east to Nova Scotia, and south to North Carolina and California.

Description: Mature larva up to 30 mm long. Head, light brown with dark brown reticulation. Prothoracic shield has central dark brown rectangle. Body, greyish brown; faint broken brown middorsal and subdorsal lines; faint, broad chevron pattern on dorsum.

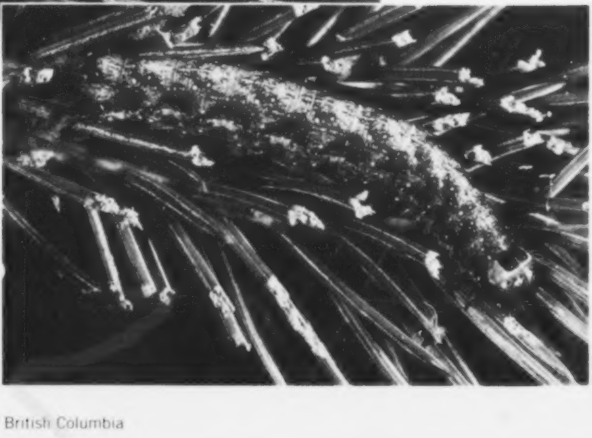
Bionomics: This species overwinters in the adult stage and becomes active in the early spring. Larvae are present late May to June, pupation occurs in July, and adults emerge August to September.

Damage: *Lithophane innominata* is a relatively uncommon, solitary defoliator.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of mid-instar larva on Sitka spruce



Dorso-lateral view of mature larva on Sitka spruce

Lithophane itata (Smith)

Host: Rocky Mountain juniper.

Distribution: Throughout the host range in the southern interior of British Columbia; south to California and Arizona.

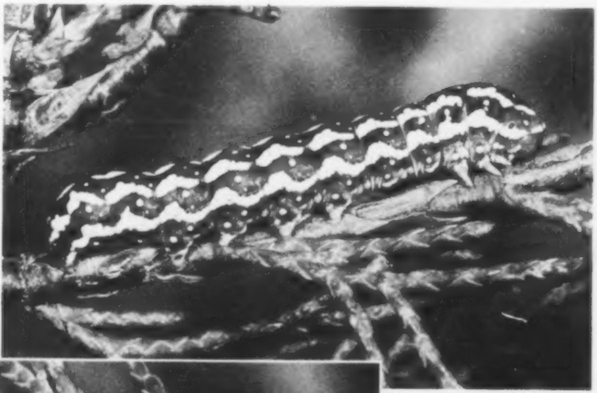
Description: Mature larva up to 28 mm long. Head, green unmarked. Body, green; white arrowhead-shaped markings along the middorsum and 2 pairs of white addorsal spots on each segment; wavy white subdorsal and spiracular stripes and a pair of white supraspiracular and subspiracular spots on each abdominal segment.

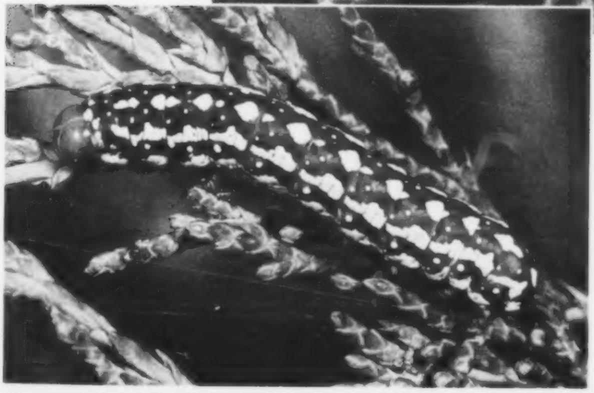
Bionomics: This species overwinters in the adult stage and becomes active in early spring and occasionally on mild winter days. Larvae are present late May to July, pupation occurs in July, and adults emerge August to September.

Damage: *Lithophane itata* is a relatively uncommon, solitary defoliator.

Similar species: No similar species occur on Rocky Mountain juniper in British Columbia.

Lateral view of mature larva on Rocky Mountain juniper





Dorso-lateral view of mature larva on Rocky Mountain juniper

Lithophane ponderosa (Troubridge & Lafontaine)

Hosts: Principal host is ponderosa pine; also occurs on lodgepole pine.

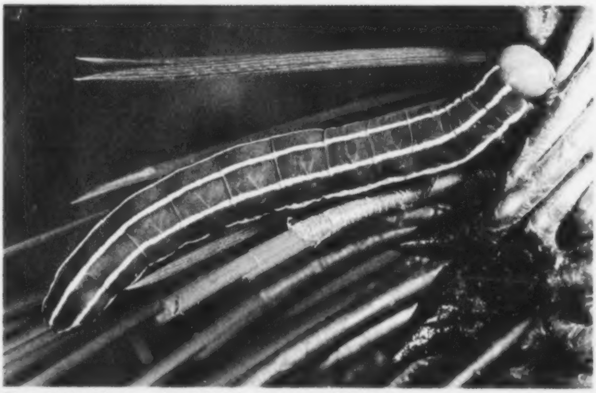
Distribution: Throughout the range of the principal host in the southern interior of British Columbia; south to California, and east to Colorado.

Description: Mature larva up to 50 mm long. Head, yellowish green unmarked. Body, green with prominent white middorsal, subdorsal and subspiracular stripes. Dorsum immediately behind head is reddish.

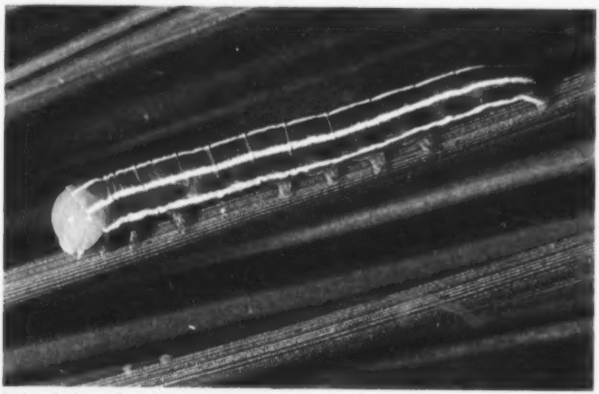
Bionomics: This species overwinters in the adult stage and becomes active in the early spring and occasionally on mild winter days. Larvae are present May to June, pupation occurs in July, and adults emerge August to September.

Damage: *Lithophane ponderosa* is a relatively uncommon, solitary defoliator.

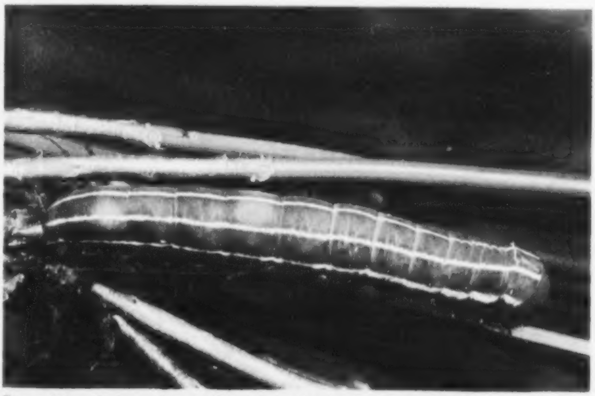
Similar species: No similar species occur on coniferous hosts in British Columbia.



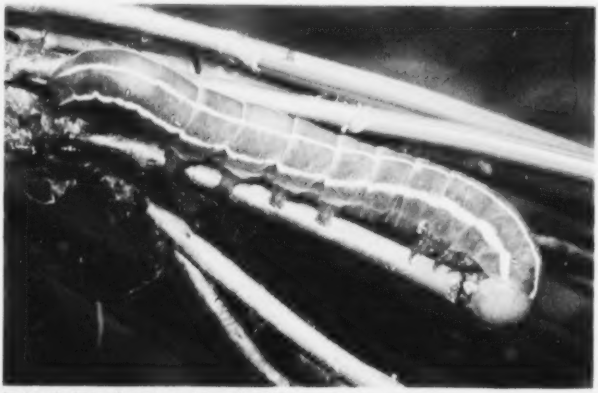
Dorso-lateral view of mature larva on ponderosa pine



Lateral view of early instar larva on ponderosa pine



Dorso-lateral view of penultimate-instar larva on ponderosa pine



Lateral view of mature larva feeding on ponderosa pine

Lithophane thaxteri

Hosts: Principal coniferous host is tamarack; also occurs on alder and willow.

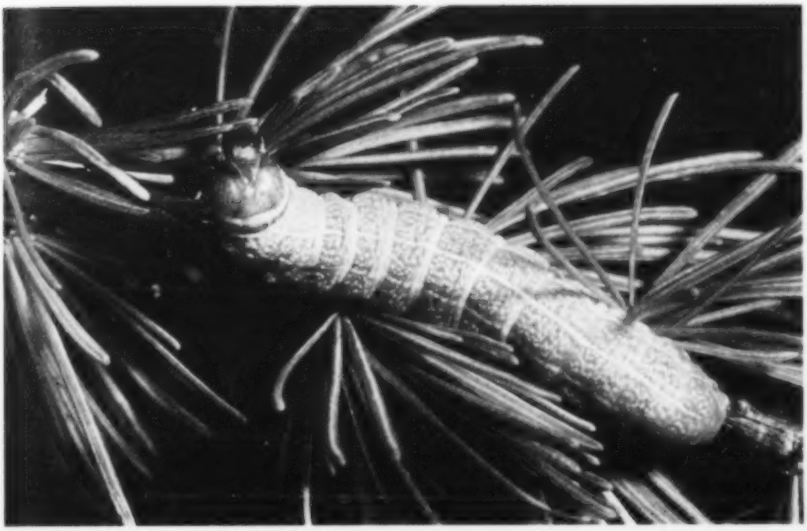
Distribution: Throughout interior of British Columbia; east to Nova Scotia and Newfoundland.

Description: Mature larva up to 30 mm long. Head, unmarked green. Body, green to bluish green, speckled with white dots; white middorsal and subdorsal lines; spiracular line composed of white dots.

Bionomics: This species overwinters in the adult stage. Larvae are present late May to June, pupation occurs in July, and adults emerge August to September.

Damage: *Lithophane thaxteri* is a relatively uncommon, solitary defoliator.

Similar species: No similar species occur on tamarack in British Columbia.



Dorsal view of mature larva on tamarack

Lithophane vivida (Dyar)

Hosts: Principal coniferous host is Douglas-fir; also occurs on hardwood hosts.

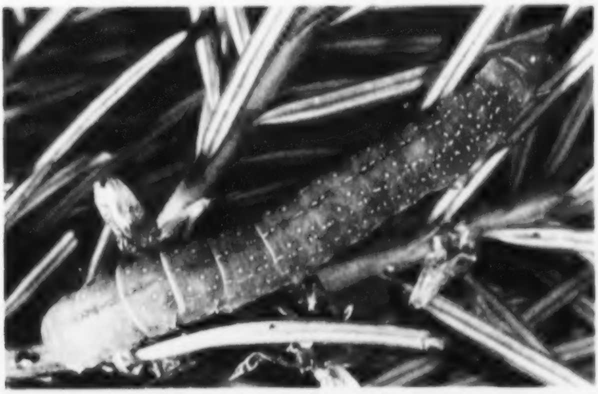
Distribution: South and central British Columbia; east to Nova Scotia, and south to North Carolina and Oregon.

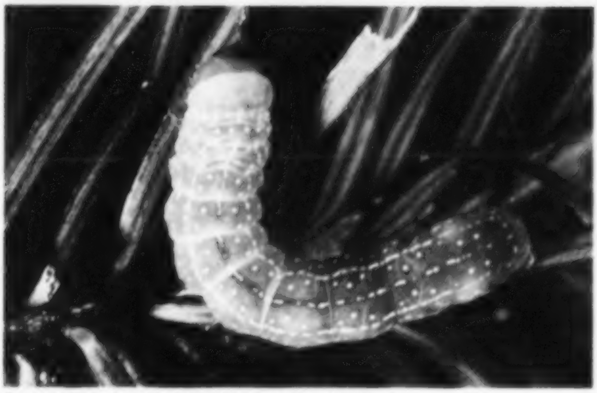
Description: Mature larva up to 32 mm long. Head, green unmarked. Body, green; middorsal and subdorsal lines, composed of white dashes; supraspiracular and spiracular lines, composed of white dots.

Bionomics: This species overwinters in the adult stage. Larvae are present late May to June, pupation occurs in July, and adults emerge August to September.

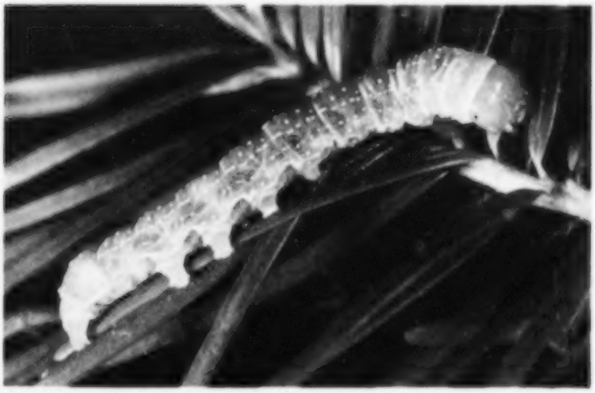
Damage: *Lithophane vivida* is a relatively uncommon, solitary defoliator.

Similar species: *Orthosia hibisci* (p. 210). *Lithophane vivida* differs from *O. hibisci* in that there are only 3 pairs of white spots on the dorsum of each abdominal segment rather than numerous white spots on each segment.

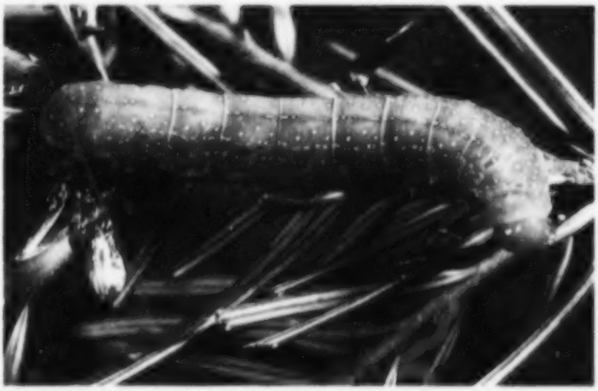

Dorso-lateral view of mature larva on Douglas-fir



Dorsal view of early instar larva on Douglas-fir



Lateral view of mid-instar larva on Douglas-fir



Dorsal view of mature larva on Douglas-fir

Orthosia hibisci (Guenée)

Hosts: Principal coniferous hosts are Engelmann spruce and white spruce; other coniferous hosts include Douglas-fir and tamarack. Hardwood hosts include trembling aspen, willow and birch.

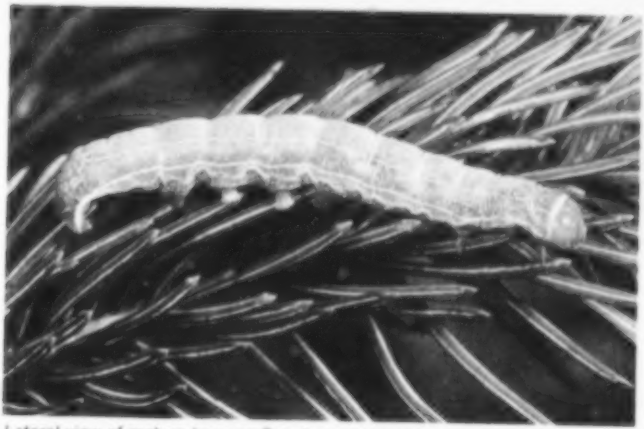
Distribution: Generally distributed throughout British Columbia from the Skeena and upper Fraser River drainages south; east to Newfoundland, and south to South Carolina and California.

Description: Mature larva up to 30 mm long. Head, unmarked green. Body, yellowish green speckled with white dots; yellowish white middorsal, subdorsal and supraspiracular lines; broad greenish yellow spiracular stripe.

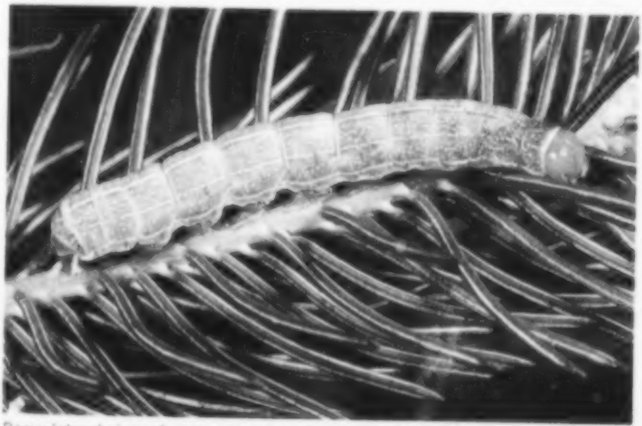
Bionomics: This species overwinters as a pupa buried in duff. Adults emerge April to May, larvae are present May to August, and pupation occurs in August.

Damage: *Orthosia hibisci* is a common, innocuous, solitary defoliator.

Similar species: *Lithophane vivida* (p. 208). *Orthosia hibisci* differs from *L. vivida* in that there are numerous white spots on the dorsum of each abdominal segment rather than only 3 pairs of white spots on each segment.



Lateral view of mature larva on Engelmann spruce



Dorso-lateral view of mature larva on Engelmann spruce

Panthea gigantea (French)

Host: Ponderosa pine.

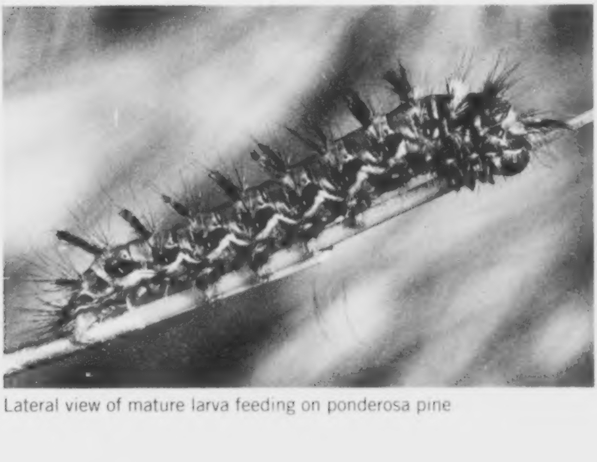
Distribution: Throughout the host range in the southern interior of British Columbia; south to California.

Description: Mature larva up to 50 mm long. Head, brown with white along margin of frontal triangle. Body, rusty brown; faint white to light brown middorsal stripe. Prominent wide black band over second thoracic segment. Striking black-bordered red band on dorsum of each thoracic segment. Body, covered with brown hairs (white on thoracic segment 2) radiating from orange tubercles; 2 long (5 to 6 mm) brown pencil tufts project vertically from each of the first 8 abdominal segments and the first thoracic segment.

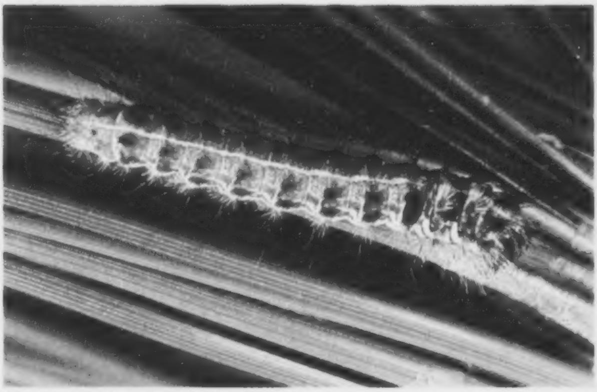
Bionomics: This species overwinters in the pupal stage. Adults emerge from late May to June. Larvae are present July to September. Pupation occurs in a cocoon in August or September.

Damage: *Panthea gigantea* is an uncommon, solitary defoliator.

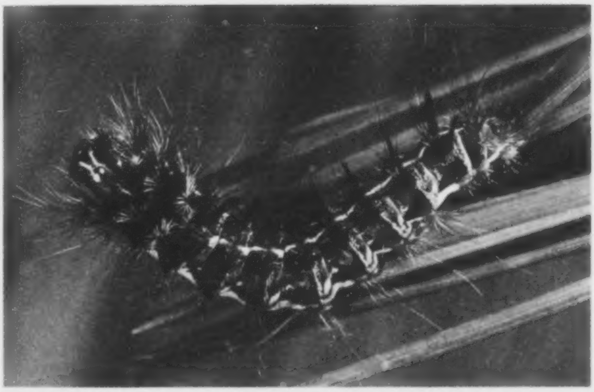
Similar species: *Panthea virginarius* (p. 214), *Orgyia* spp. (p. 176–179) and *Dasychira grisefacta* (p. 174) have larvae covered with long hairs arranged in prominent clusters or tufts. Although superficially similar to these species, the larva of *P. gigantea* is easily distinguished by its distinctive color and arrangement of body hairs.



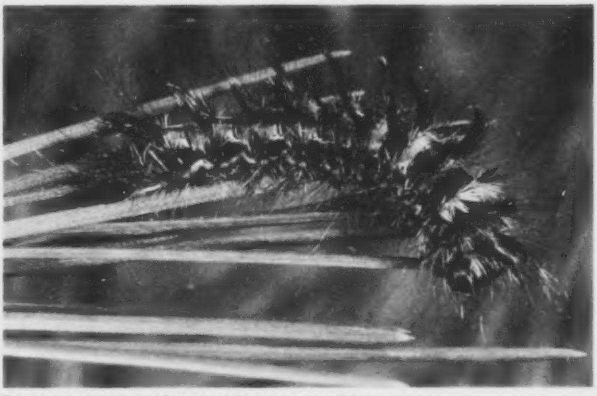
Lateral view of mature larva feeding on ponderosa pine



Dorsal view of early instar larva on ponderosa pine



Dorso-lateral view of penultimate-instar larva on ponderosa pine



Dorso-lateral view of mature larva on ponderosa pine

Panthea virginarius Grote

Hosts: Principal hosts are lodgepole pine and Douglas-fir; other hosts include western hemlock, amabilis fir, ponderosa pine, western larch, Sitka spruce, Engelmann spruce, subalpine fir, grand fir, white spruce, western white pine and mountain hemlock.

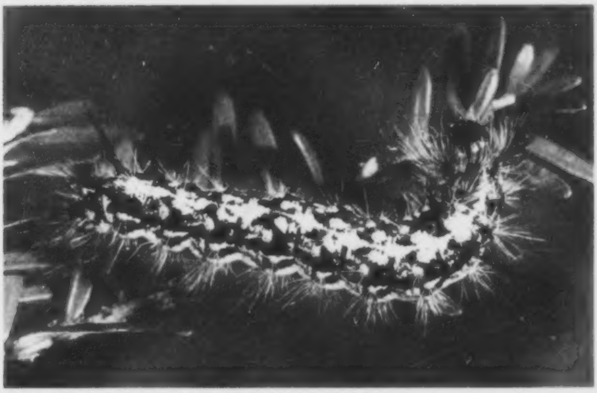
Distribution: Throughout British Columbia south of the Skeena and Fraser River drainages; south to California.

Description: Mature larva up to 48 mm long. This species is highly variable and exhibits a wide range of color pattern forms. The head of the most common form is light grey with black mottling. The body is light grey with black mottling and has a middorsal diamond pattern. Black hairs radiating from orange tubercles cover the body; 2 long black pencil tufts project vertically from the first thoracic segment and the first and eighth abdominal segments. A solid black form has white hairs radiating from orange tubercles; another form has a black body with a prominent white middorsal diamond pattern, a wavy white spiracular stripe, and white hairs radiating from pinkish yellow tubercles.

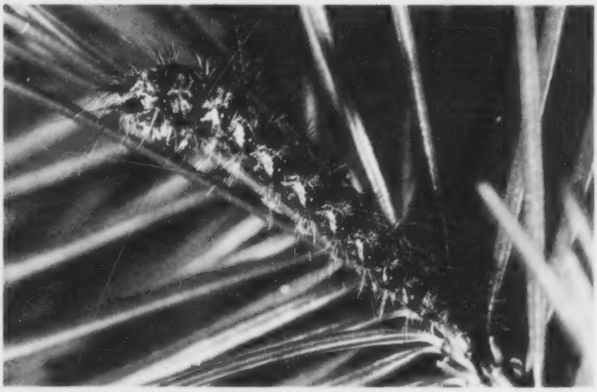
Bionomics: This species overwinters in the pupal stage. Adults emerge in late May to June, larvae are present July to September, and pupation occurs in a cocoon in late August or September.

Damage: *Panthea virginarius* is a common innocuous, solitary defoliator.

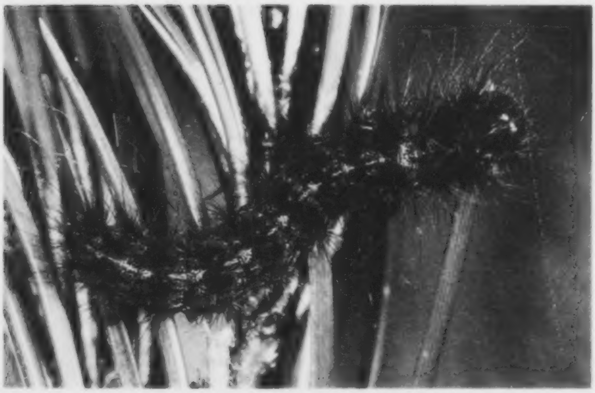
Similar species: *Panthea gigantea* (p. 212), *Orgyia* spp. (p. 176–179) and *Dasychira grisefacta* (p. 174) have larvae covered with long hairs arranged in prominent clusters or tufts. Although superficially similar to these species, the larva of *P. virginarius* is easily distinguished by its distinctive color and arrangement of body hairs.



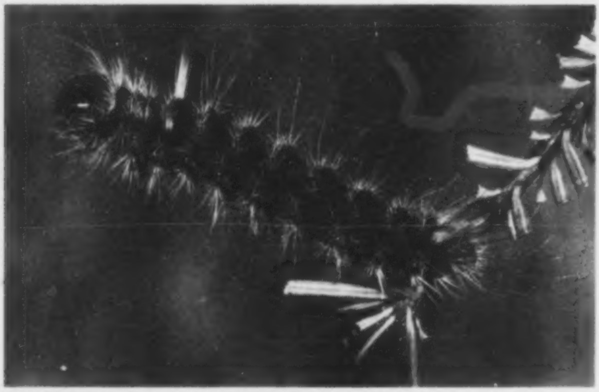
Dorso-lateral view of mature larva (black and white form) on western hemlock



Lateral view of mid-instar larva on Douglas-fir



Dorsal view of mature larva (most common form) on lodgepole pine



Dorso-lateral view of mature larva (black form) on Douglas-fir

Phlogophora periculosa Guenée

Hosts: Principal coniferous hosts are western hemlock and Douglas-fir; other coniferous hosts include amabilis fir, western redcedar, balsam fir and Sitka spruce. Nonconiferous hosts include alder and willow.

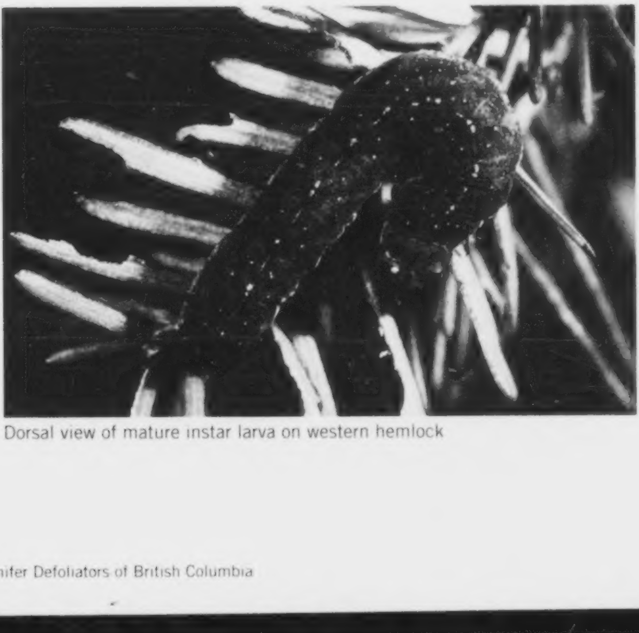
Distribution: Southern British Columbia; east to Newfoundland, and south to California and Georgia.

Description: Mature larva up to 28 mm long. Head, chestnut brown with dark spots. Body, tan brown; dashed white middorsal line; a pair of white subdorsal spots on each abdominal segment; yellowish cream spiracular line. The body of a mid-instar larva is green, becoming brown in the penultimate-instar.

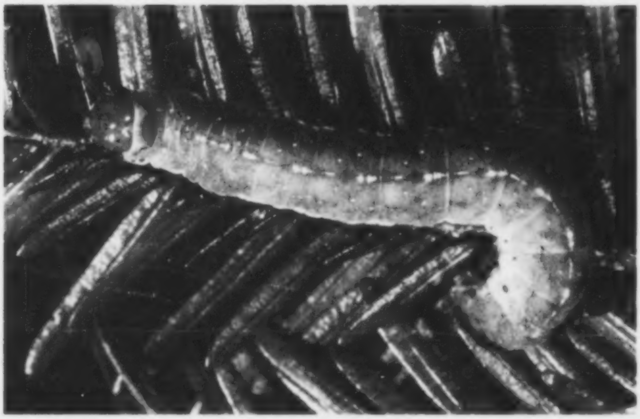
Bionomics: This species overwinters as a mid-instar larva. Larval feeding resumes in April and continues until May. Pupation occurs in June. Adults emerge in July, mate, and lay eggs on host foliage. Larvae emerge soon after and feed until the onset of cold weather.

Damage: *Phlogophora periculosa* is an uncommon, solitary defoliator.

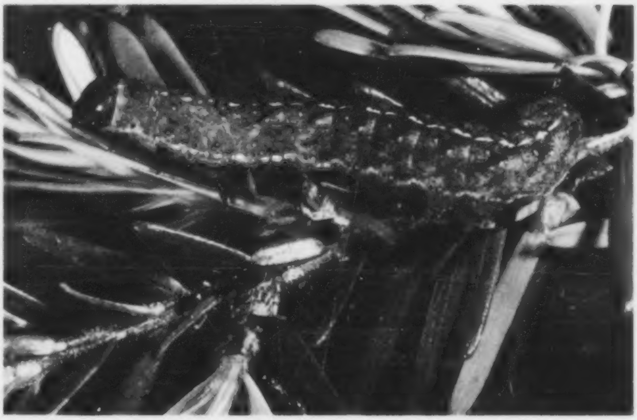
Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorsal view of mature instar larva on western hemlock



Dorsal view of mid-instar larva on western hemlock



Dorso-lateral view of penultimate-instar larva on western hemlock

Syngrapha alias Ottolengui

Hosts: Principal hosts are Engelmann spruce, white spruce, Sitka spruce and black spruce; other hosts include western hemlock, Douglas-fir, amabilis fir, grand fir and subalpine fir.

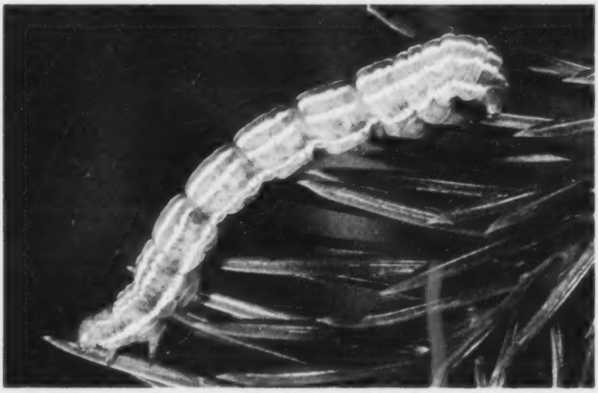
Distribution: Throughout British Columbia; east to Newfoundland, north to Great Slave Lake, and south to California.

Description: Mature larva up to 25 mm long. Head, green unmarked. Body, green with white addorsal, subdorsal and spiracular stripes; addorsal stripes are broader than subdorsal and spiracular stripes. There are 2 pairs of mid-abdominal prolegs instead of the normal 4 pairs found in cutworms.

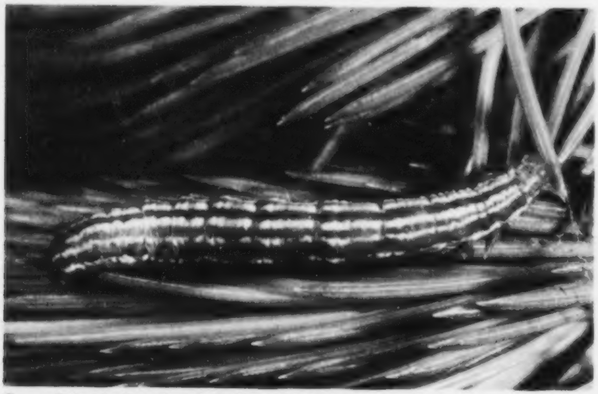
Bionomics: This species overwinters as a third-instar larva. Larval feeding resumes in May and continues until early June. Pupation occurs in June. Adults emerge from late June to July, mate, and lay eggs on host foliage. Larvae emerge soon after. Each larva hollows the undersides of several needles before the onset of cold conditions.

Damage: *Syngrapha alias* is a common, innocuous, solitary defoliator.

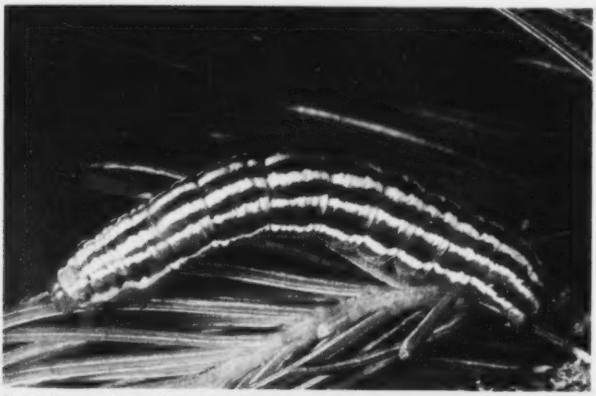
Similar species: *Syngrapha angulidens* (p. 220), *S. celsa* (p. 222), *S. rectangula* (p. 224) and *S. viridisigma* (p. 226). *Syngrapha alias* differs from *S. angulidens*, *S. celsa* and *S. rectangula* in that the space between the addorsal and subdorsal stripes is greater than the width of the addorsal stripe, rather than being nearly equal to or distinctly less than this width. It differs from *S. viridisigma* in that it has much broader addorsal and subdorsal stripes and the lateral stripe is white rather than yellowish.



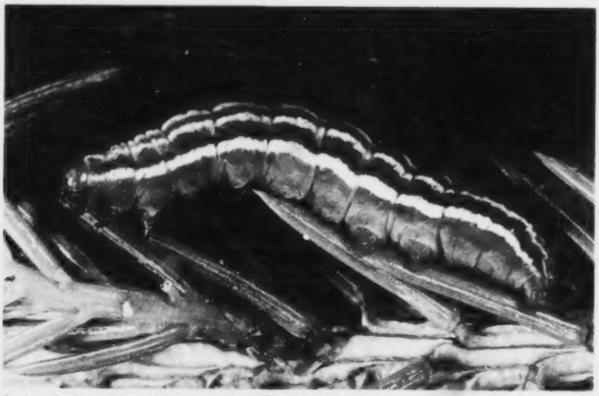
Dorso-lateral view of prepupal larva on Sitka spruce



Dorso-lateral view of mature larva with bands of exuvia, on Engelmann spruce



Dorso-lateral view of mature larva on Engelmann spruce



Lateral view of mature larva on Engelmann spruce

Syngrapha angulidens (J.B. Smith)

Hosts: Principal hosts are subalpine fir and Engelmann spruce.

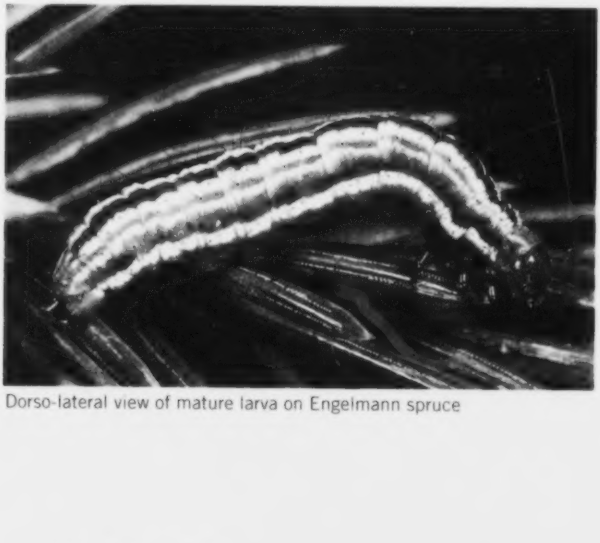
Distribution: Generally distributed throughout the interior of British Columbia from the upper Fraser River drainage south; east to mountainous western Alberta, and south to Arizona and New Mexico.

Description: Mature larva up to 24 mm long. Head, yellowish green with brown spots. Body, green with white addorsal, subdorsal and spiracular stripes; addorsal and spiracular stripes are similar in width and broader than the subdorsal stripe. There are 2 pairs of mid-abdominal prolegs instead of the normal 4 pairs found in cutworms.

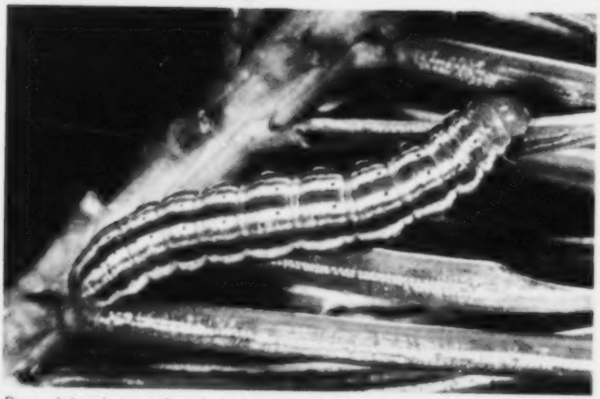
Bionomics: This species overwinters as a third-instar larva. Larval feeding resumes in May and continues until early June. Pupation occurs in June. Adults emerge from late June to July, mate, and lay eggs on host foliage. Larvae emerge soon after. Each larva hollows the undersides of several needles before the onset of cold conditions.

Damage: *Syngrapha angulidens* is an uncommon, solitary defoliator.

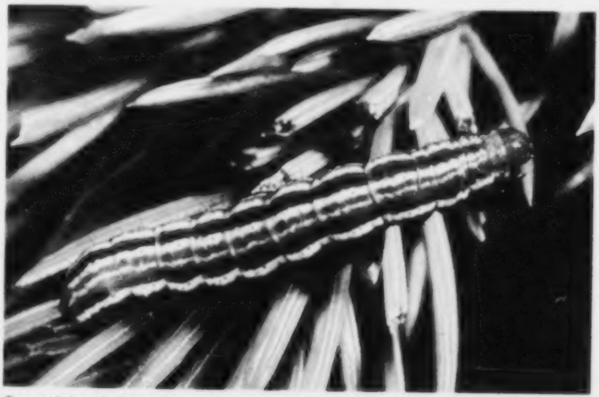
Similar species: *Syngrapha alias* (p. 218), *S. celsa* (p. 222), *S. rectangula* (p. 224) and *S. viridisigma* (p. 226). *Syngrapha angulidens* differs from these species in that its head capsule is covered with dark spots rather than being unmarked.



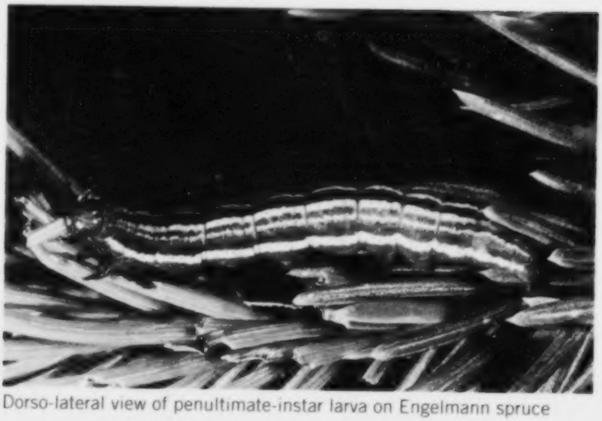
Dorso-lateral view of mature larva on Engelmann spruce



Dorso-lateral view of early instar larva (overwintering stage) on Engelmann spruce



Dorso-lateral view of penultimate-instar larva on Engelmann spruce



Dorso-lateral view of penultimate-instar larva on Engelmann spruce

Syngrapha celsa (Henry Edwards)

Hosts: Principal hosts are amabilis fir, subalpine fir and grand fir; other hosts include western hemlock, Engelmann spruce and white spruce.

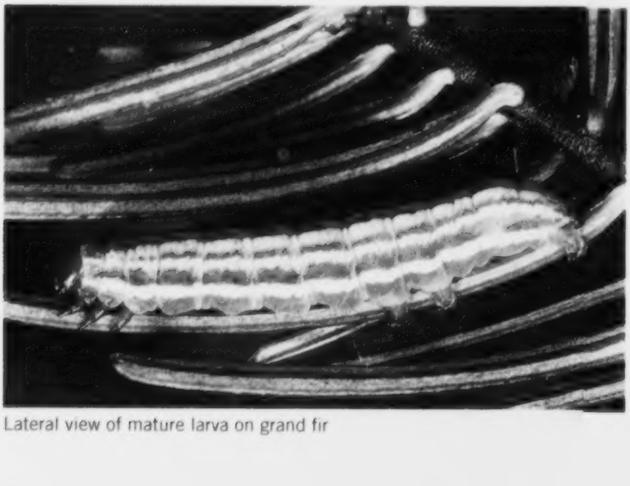
Distribution: Generally distributed throughout British Columbia from the Skeena and upper Fraser River drainages south; south to California.

Description: Mature larva up to 24 mm long. Head, unmarked green. Body, green with white addorsal, subdorsal and spiracular stripes; addorsal stripes are broader than the subdorsal and spiracular stripes. There are 2 pairs of mid-abdominal prolegs instead of the normal 4 pairs found in cutworms.

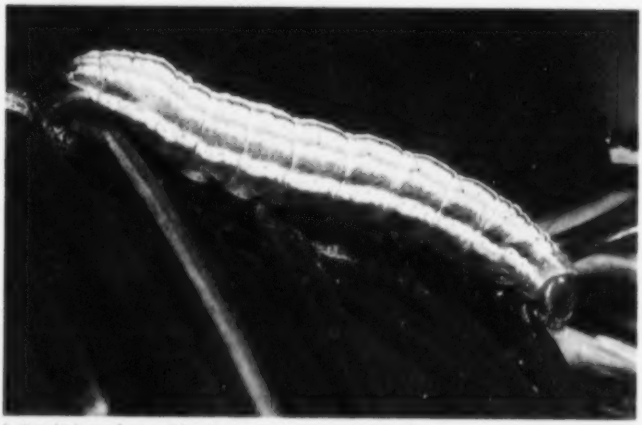
Bionomics: This species overwinters as a third-instar larva. Larval feeding resumes in May and continues until early June. Pupation occurs in June. Adults emerge from late June to July, mate, and lay eggs on host foliage. Larvae emerge soon after. Each larva hollows the undersides of several needles before the onset of cold conditions.

Damage: *Syngrapha celsa* is a common, innocuous, solitary defoliator.

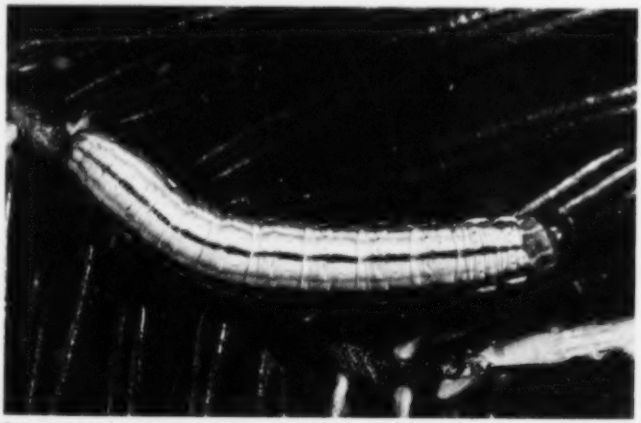
Similar species: *Syngrapha alias* (p. 218), *S. angulidens* (p. 220), *S. rectangula* (p. 224) and *S. viridisigma* (p. 226). *Syngrapha celsa* differs from these species in that the space between the addorsal and subdorsal stripes is less than half the width of the addorsal stripe, rather than being distinctly wider than or nearly equal to this width.



Lateral view of mature larva on grand fir



Lateral view of penultimate-instar larva on grand fir



Dorsal view of penultimate-instar larva on grand fir

Syngrapha rectangula (Kirby)

Hosts: Principal host is western hemlock; other hosts include Douglas-fir, white spruce, amabilis fir, grand fir and Sitka spruce.

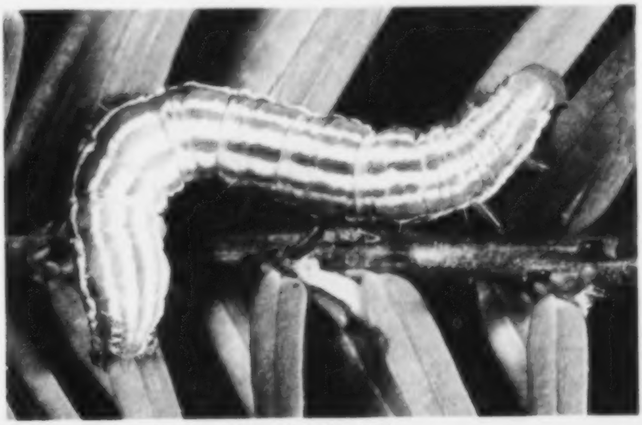
Distribution: Throughout British Columbia south of the Skeena and Fraser River drainages; south to California, and east to Newfoundland.

Description: Mature larva up to 25 mm long. Head, unmarked green. Body, green with white addorsal, subdorsal and spiracular stripes; addorsal stripes are broader than the subdorsal and spiracular stripes. There are 2 pairs of mid-abdominal prolegs instead of the normal 4 pairs found in cutworms.

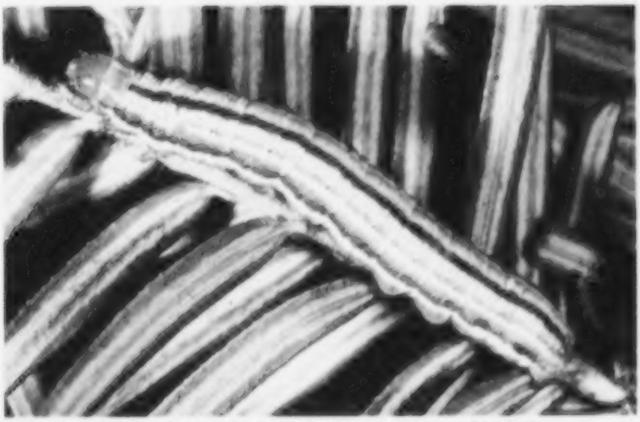
Bionomics: This species overwinters as a third-instar larva. Larval feeding resumes in May and continues until early June. Pupation occurs in June. Adults emerge from late June to July, mate, and lay eggs on host foliage. Larvae emerge soon after. Each larva hollows the undersides of several needles before the onset of cold conditions.

Damage: *Syngrapha rectangula* is a common, innocuous, solitary defoliator.

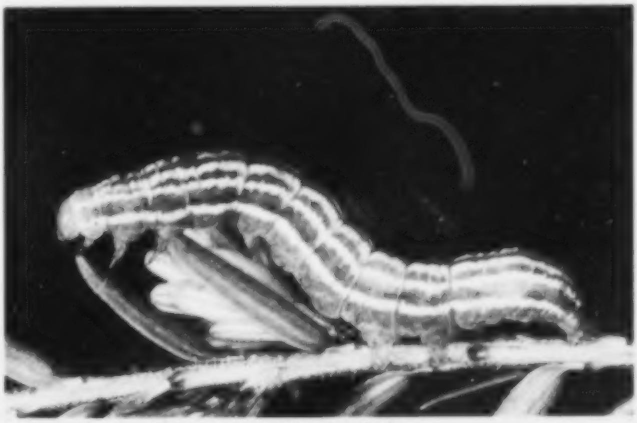
Similar species: *Syngrapha alias* (p. 218), *S. angulidens* (p. 220), *S. celsa* (p. 222) and *S. viridisigma* (p. 226). *Syngrapha rectangula* differs from the other species in that the space between its addorsal and subdorsal stripes is nearly equal to the width of the addorsal stripe, rather than being much wider or much narrower. It differs from *S. angulidens* in that its head capsule is unmarked rather than being covered with dark spots.



Dorsal view of mature larva on western hemlock



Dorso-lateral view of penultimate-instar larva on western hemlock



Lateral view of mature larva on western hemlock

Syngrapha viridisigma (Grote)

Hosts: Principal hosts are Engelmann spruce, white spruce, Douglas-fir and subalpine fir; it also occurs on balsam fir and lodgepole pine.

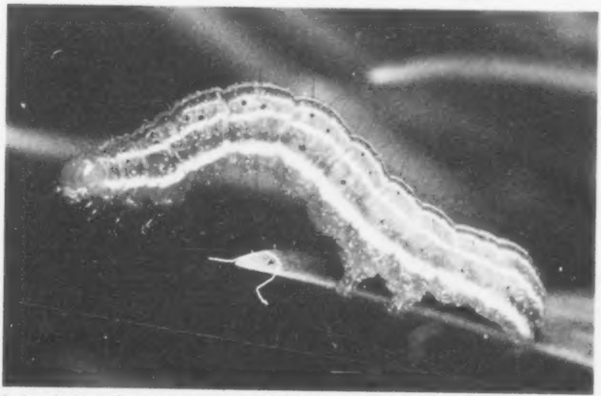
Distribution: This species is generally distributed throughout British Columbia; it also occurs north to the Yukon, east to Newfoundland, and south to Arizona.

Description: Mature larva up to 25 mm long. Head, unmarked greenish yellow. Body, yellowish green; white addorsal, subdorsal and spiracular stripes; spiracular stripe is much broader than the addorsal and subdorsal stripes. There are 2 pairs of mid-abdominal prolegs instead of the normal four found in cutworms.

Bionomics: This species overwinters as a third-instar larva. Larval feeding resumes in May and continues until early June. Pupation occurs in June. Adults emerge from late June to July, mate, and females lay eggs on host foliage. Larvae emerge soon after. Each larva hollows the undersides of several needles before the onset of cold conditions.

Damage: *Syngrapha viridisigma* is a common innocuous solitary defoliator.

Similar species: *Syngrapha alias* (p. 218), *S. angulidens* (p. 220), *S. celsa* (p. 222) and *S. rectangula* (p. 224). *Syngrapha viridisigma* differs from these species in that the addorsal stripe is subequal to, or narrower than, the subdorsal stripe.



Lateral view of mid-instar larva on lodgepole pine

Xestia mustelina (J.B. Smith)

Hosts: Principal hosts are Douglas-fir and western hemlock; other hosts include western redcedar, grand fir, amabilis fir, subalpine fir, Engelmann spruce, white spruce, Sitka spruce, western larch and mountain hemlock.

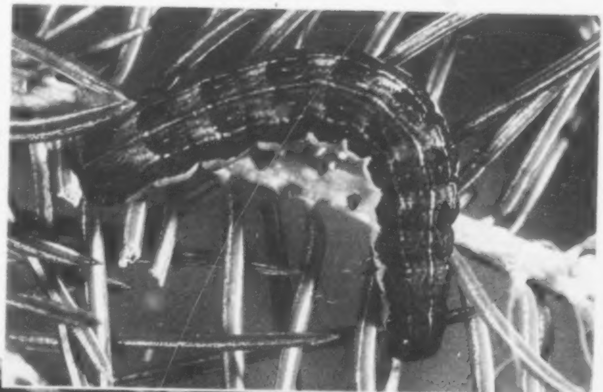
Distribution: Generally distributed throughout British Columbia from the Nass and upper Fraser River drainages south; south to California.

Description: Mature larva up to 32 mm long. Head, cream to brown with brown netting. Body, brown; dorsum, light brown with brown-margined white middorsal and subdorsal stripes. Broad yellowish white spiracular stripe.

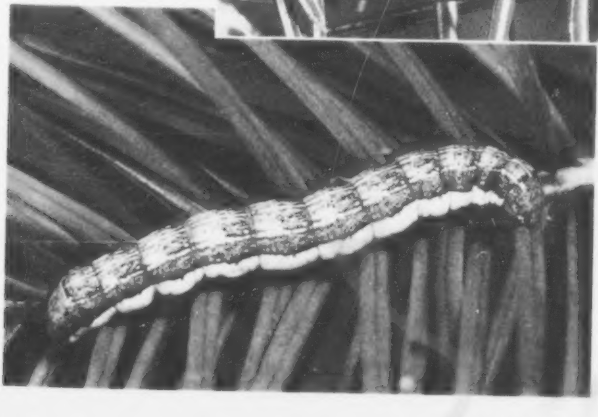
Bionomics: This species overwinters as a mid-instar larva. Larvae are present May to mid-July, pupation occurs in July, and adults emerge July to August.

Damage: *Xestia mustelina* is a common, innocuous, solitary defoliator.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorsal view of penultimate-instar larva on Engelmann spruce



Dorso-lateral view of mature larva on Douglas-fir

Xestia perquiritata (Morrison)

Hosts: Principal hosts are Engelmann spruce, white spruce, black spruce, subalpine fir and tamarack.

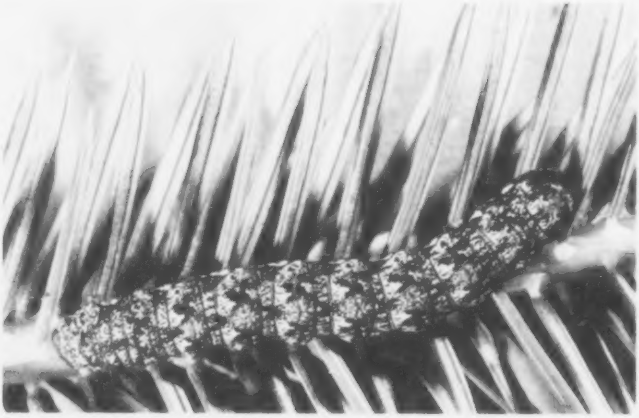
Distribution: Throughout the interior of British Columbia; east to Newfoundland, and south to North Carolina and Oregon.

Description: Mature larva up to 36 mm long. Head, light brown with dark netting. Body, brown; dorsum, marked with a somewhat obscure middorsal diamond pattern and dark brown chevrons; creamy yellow dashes along the spiracular line.

Bionomics: Overwintering stage is not known, but is likely as a mid-instar larva. Larvae are present May to June, pupation occurs in July, and adults emerge mid-June to mid-July.

Damage: *Xestia perquiritata* is an uncommon, solitary defoliator.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorsal view of mature larva on Engelmann spruce

Xestia praevia Lafontaine

Hosts: Principal hosts in British Columbia are Engelmann spruce and Douglas-fir; also occurs on lodgepole pine.

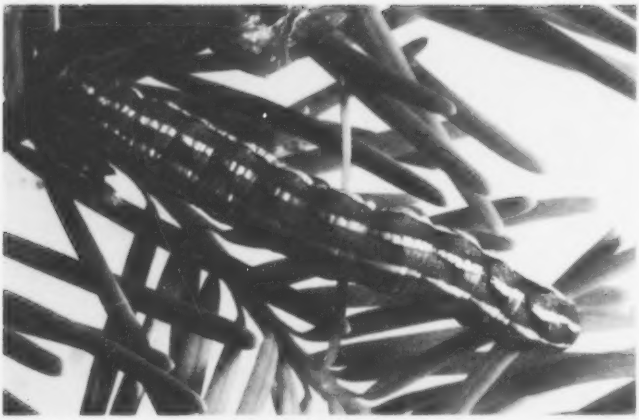
Distribution: Central and southern interior of British Columbia; east to Nova Scotia, and south to North Carolina.

Description: Mature larva up to 32 mm long. Head, brown with dark netting. Body, greyish brown with black-margined greyish white middorsal and subdorsal stripes; broad greyish white subspiracular stripe; a thin black spiracular stripe.

Bionomics: Overwintering stage is not known, but is likely as a mid-instar larva. Larvae are present May to early July, pupation occurs in July, and adults emerge July to August.

Damage: *Xestia praevia* is an uncommon, solitary defoliator.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of mature larva on Douglas-fir

Xylotype arcadia Barnes & Benjamin

Hosts: Principal hosts are Engelmann spruce and white spruce.

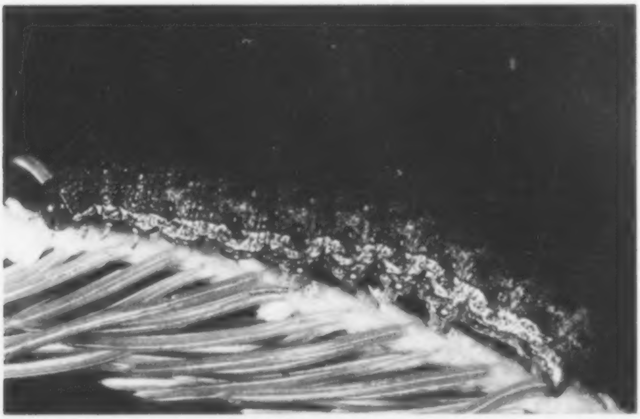
Distribution: Throughout the interior of British Columbia; east to New Brunswick, and south to Oregon.

Description: Mature larva up to 33 mm long. Head, yellowish brown with dark netting. Body, yellowish brown with dark grey mottle; 2 pairs of white spots on the dorsum of each abdominal segment; broad mottled cream-colored subspiracular stripe, margined above with a wavy black spiracular stripe.

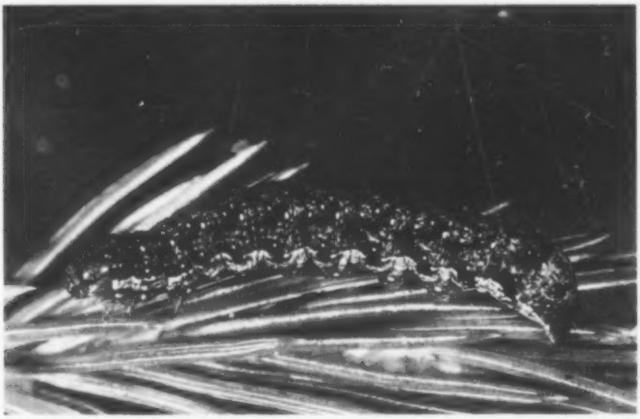
Bionomics: Overwintering stage is not known. Larvae are present May to June, pupation occurs in June, and adults emerge late June to July.

Damage: *Xylotype arcadia* is an uncommon, solitary defoliator.

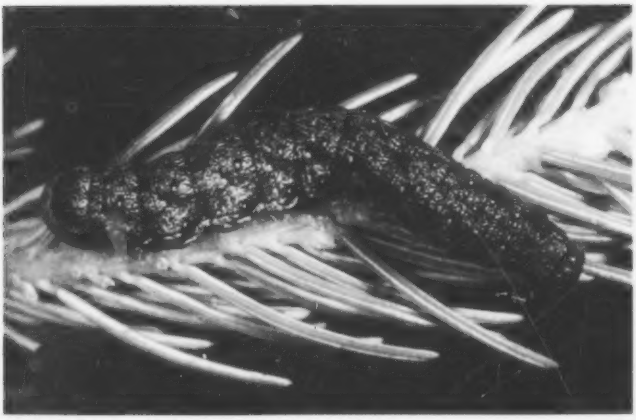
Similar species: No similar species occur on coniferous hosts in British Columbia.



Lateral view of mature larva on Engelmann spruce



Dorso-lateral view of mid-instar larva on Engelmann spruce



Dorsal view of mature larva on Engelmann spruce

Zale duplicata (Bethune)

Hosts: Lodgepole pine and jack pine.

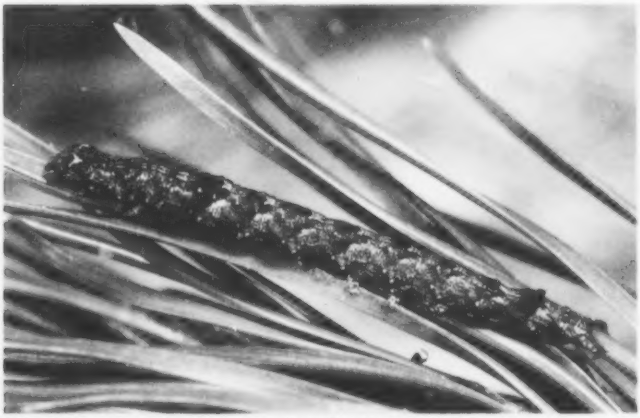
Distribution: Throughout British Columbia; east to western Quebec.

Description: Mature larva up to 35 mm long. This species has 2 distinct color forms. Head, mottled rusty brown or grey, with prominent white markings at the vertices. Body, elongate, rusty brown (most common) or dark grey; white or greyish white middorsal Y-shaped markings. Prominent pair of tubercles on dorsum of eighth abdominal segment. First 2 pairs of mid-abdominal prolegs are reduced in size. The color pattern of the early to mid-instar larva is unlike that of the mature larva.

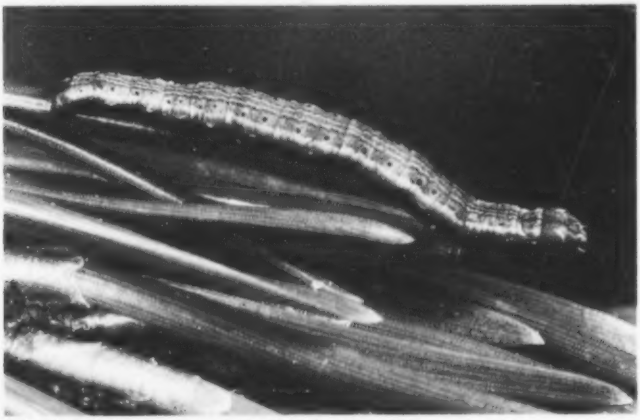
Bionomics: This species overwinters in the pupal stage. Adults emerge in May, larvae are present June to August, and pupation occurs in August.

Damage: *Zale duplicata* is a common, innocuous, solitary defoliator.

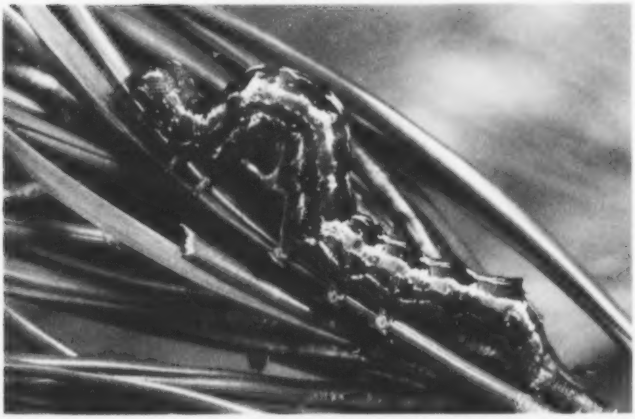
Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of mature larva (grey form) on lodgepole pine



Lateral view of early instar larva on lodgepole pine



Dorso-lateral view of mature larva (rusty brown form) on lodgepole pine

Schizura unicornis (J.E. Smith)
Unicorn caterpillar

Hosts: Western larch. Hardwood hosts include alder, willow, oak, birch and poplar.

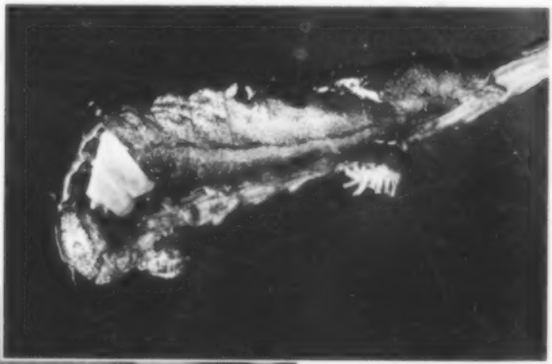
Distribution: Southern British Columbia; east to Nova Scotia, and south to Florida and Mexico.

Description: Mature larva up to 34 mm long. Head, light brown with a single tubercle on the vertex of each lobe. Thorax, green with a brown triangular middorsal marking. Body, rusty brown with green or white V-shaped dorsal markings on the sixth and seventh abdominal segments; paired hornlike protuberances on the first and eighth abdominal segments.

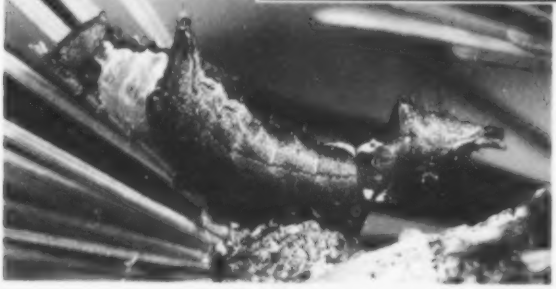
Bionomics: This species overwinters as a prepupal larva in a cocoon amongst litter on the forest floor. Pupation occurs in spring, and adults emerge in June. The female lays about 300 eggs in a mass on the underside of host foliage. Larvae are present July to September.

Damage: *Schizura unicornis* is a relatively uncommon, solitary defoliator.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of mature larva on western larch



Lateral view of mature larva on western larch

Neophasia menapia (C. & R. Felder)
Pine white

Hosts: Principal host is ponderosa pine; other hosts include lodgepole pine and Douglas-fir.

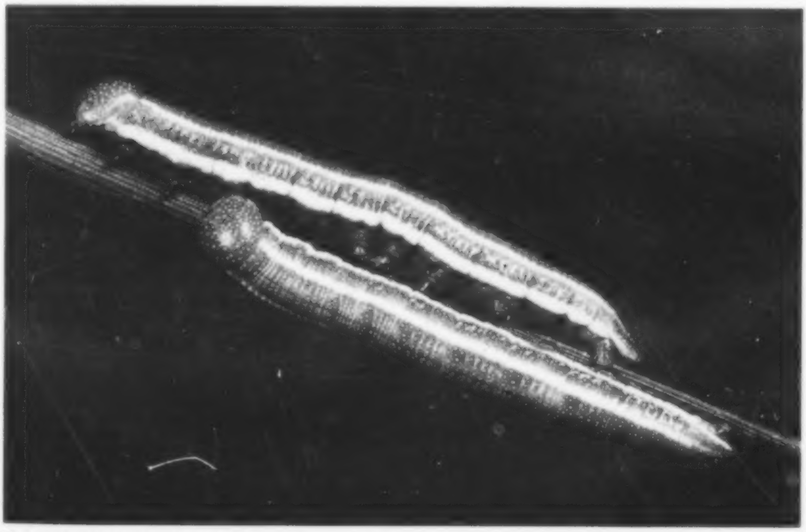
Distribution: Southern British Columbia from the Bella Coola and Chilcotin drainages south and east to the Rocky Mountain Trench; south to California and New Mexico.

Description: Mature larva up to 25 mm long. Head and body, green with white flecking; subdorsal and spiracular stripes, cream to yellowish white. Several minute annuli ring each abdominal segment.

Bionomics: This species overwinters in the egg stage. Larvae emerge in June and feed gregariously on older foliage; mature larvae feed individually on the new flush. Larvae pupate in July on trunk, branches, or low vegetation. Adults emerge 10 to 15 days later, and are in flight from July to August. Eggs are laid in rows on needles.

Damage: The pine white is a common and occasionally destructive colonial defoliator. A localized outbreak near Okanagan Landing from 1962 to 1966 resulted in limited mortality of ponderosa pine across 150 ha.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Mature larvae on ponderosa pine

Dioryctria pseudotsugella (Munroe)

Hosts: Principal host is Douglas-fir; other hosts include western hemlock and grand fir.

Distribution: Generally distributed throughout British Columbia from the Skeena and upper Fraser River drainages south; east to Utah, and south to California and New Mexico.

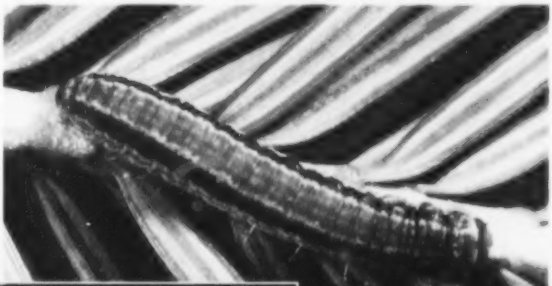
Description: Mature larva up to 15 mm long. Head, unmarked brown. Body, brown; dorsum, rusty brown; narrow creamy white subdorsal and spiracular stripes; broad, purplish brown supraspiracular stripe.

Bionomics: This species overwinters as an early instar larva in a silken hibernaculum. Larvae are present May to July, pupation occurs in July, and adults emerge July to August.

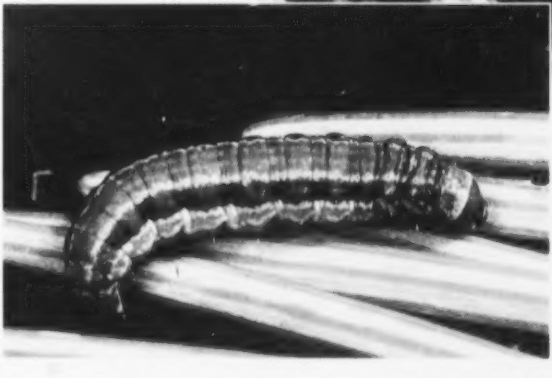
Population fluctuations tend to be synchronous with those of the western spruce budworm.

Damage: *Dioryctria pseudotsugella* is a common, occasionally abundant, solitary defoliator. It will also feed on cones if they are available.

Similar species: *Dioryctria reniculleloides* (p. 237). *Dioryctria pseudotsugella* differs from *D. reniculleloides* in that the colors of the dorsum and supraspiracular stripes are more intense and the supraspiracular stripes are not flecked with orange. These species also occur on different hosts.



Dorsal view of mature larva on Douglas-fir



Dorso-lateral view of mature larva on Douglas-fir

Dioryctria reniculleloides Muturra & Munroe

Spruce coneworm

Hosts: Principal hosts are Engelmann spruce, white spruce, black spruce and Sitka spruce.

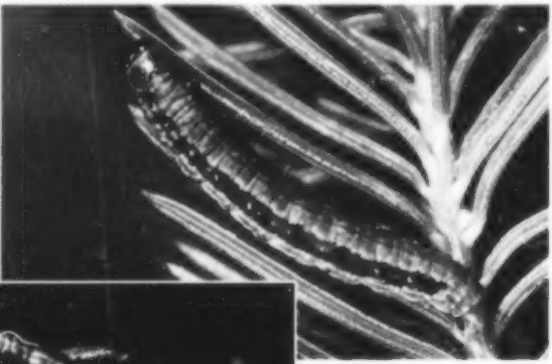
Distribution: Generally distributed throughout British Columbia; east to Newfoundland, south to New York and California.

Description: Mature larva up to 15 mm long. Head, unmarked dark brown. Body, brown; dorsum, rusty brown; supraspiracular stripe, broad, purplish brown, and flecked with orange.

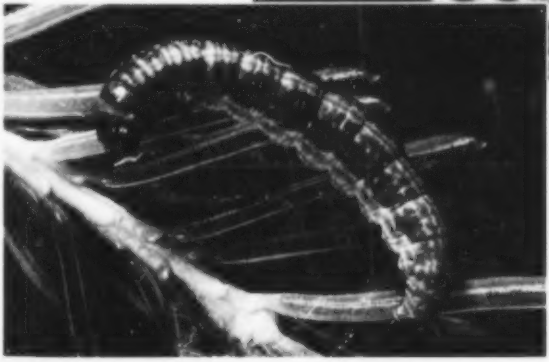
Bionomics: This species overwinters as an early instar larva in a silken hibernaculum. Larvae are present May to July, pupation occurs in July, and adults emerge July to August.

Damage: The spruce coneworm is a common solitary defoliator. The larva will preferentially feed on cones if they are available.

Similar species: *Dioryctria pseudotsugella* (p. 236). *Dioryctria reniculleloides* differs from *D. pseudotsugella* in that the colors of the dorsum and supraspiracular stripe are less intense and the supraspiracular stripes are flecked with orange. These species also occur on different hosts.



Dorso-lateral view of mature larva on Engelmann spruce



Dorso-lateral view of mature larva on white spruce

Dolichomia thymetusalis (Walker)

Hosts: Black spruce, Engelmann spruce and white spruce.

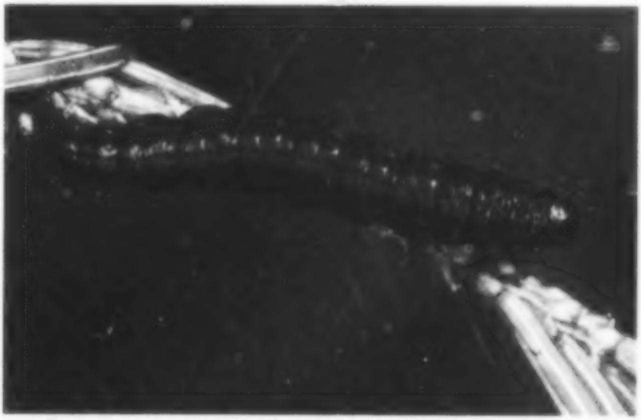
Distribution: Central and northern interior of British Columbia; east to Newfoundland, north to the Yukon, and south to New York.

Description: Mature larva up to 20 mm long. Head, unmarked brown to black. Body, tan with dark brown middorsal, subdorsal and spiracular stripes.

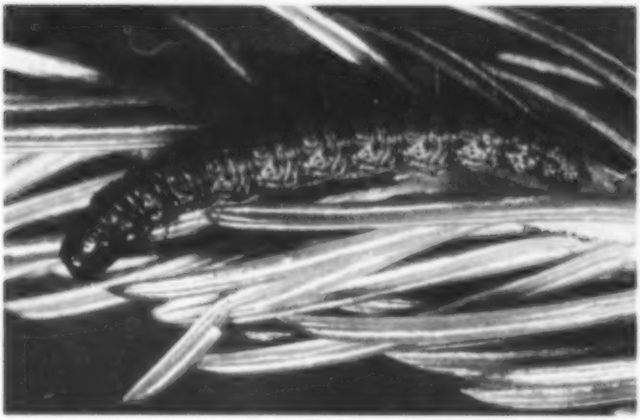
Bionomics: This species overwinters in the pupal stage. Adults emerge in May. Larvae are present June to August. Pupation occurs in August. This species is usually found in the crown of black spruce, often with *Archips alberta* (p. 248), feeding on foliage and cones.

Damage: *Dolichomia thymetusalis* is an uncommon, solitary defoliator. Some damage to the cone crop may occur.

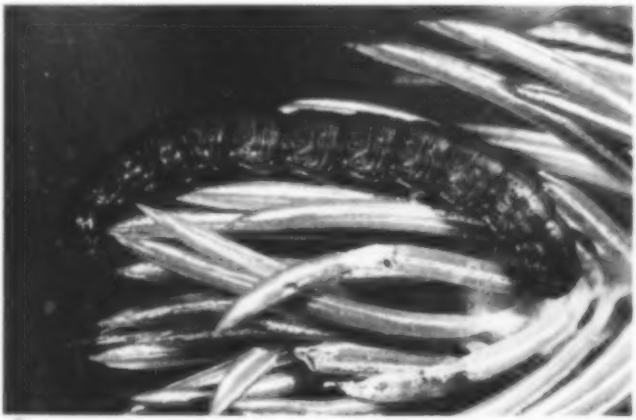
Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorsal view of prepupal larva on Engelmann spruce



Dorso-lateral view of mature larva on Engelmann spruce



Lateral view of mature larva on Engelmann spruce

Promylea lunigerella Ragonot

Hosts: Principal host is grand fir; also occurs on amabilis fir.

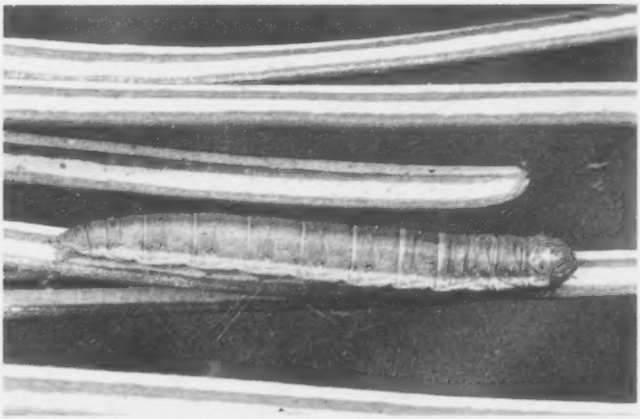
Distribution: South coastal British Columbia; south to California.

Description: Mature larva up to 20 mm long. Head, light green with dark mottle. Body, green; narrow dark green middorsal stripe; broad greenish yellow subspiracular stripe.

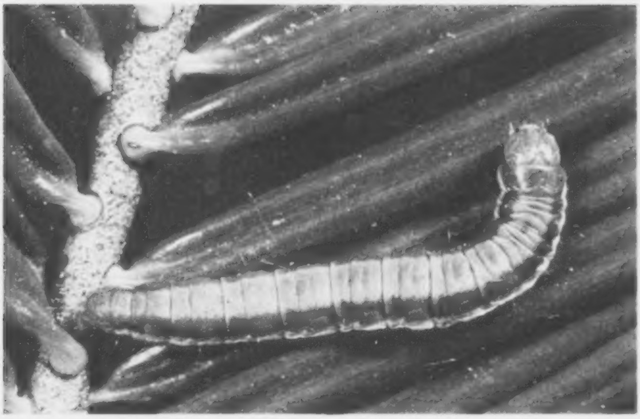
Bionomics: Overwintering stage is not known. Larvae are present May to mid-June, pupation occurs in June or July, and adults emerge July to early August.

Damage: *Promylea lunigerella* is a common, innocuous, solitary defoliator.

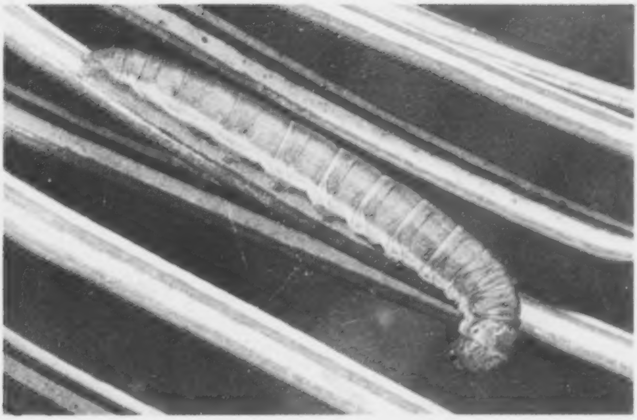
Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of mature larva on grand fir



Dorso-lateral view of penultimate-instar larva on grand fir



Dorso-lateral view of mature larva on grand fir

Hyalophora euryalis (Walker)

Ceanothus silk moth

Hosts: Principal coniferous hosts are Douglas-fir and grand fir; other hosts include alder, willow, birch, ceanothus and manzanita.

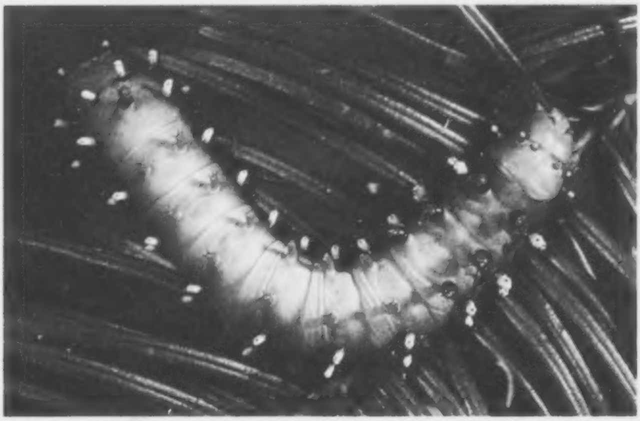
Distribution: Southern British Columbia; south to California.

Description: Mature larva up to 90 mm long. Head, green with 2 black spots on the vertices (not prepupal larva). Body, yellowish green (penultimate-instar), bluish green (final instar) or bluish (prepupal); subdorsal row of orange to orange–red tubercles tipped with black spines; supraspiracular and subspiracular rows of blue tubercles tipped with black spines.

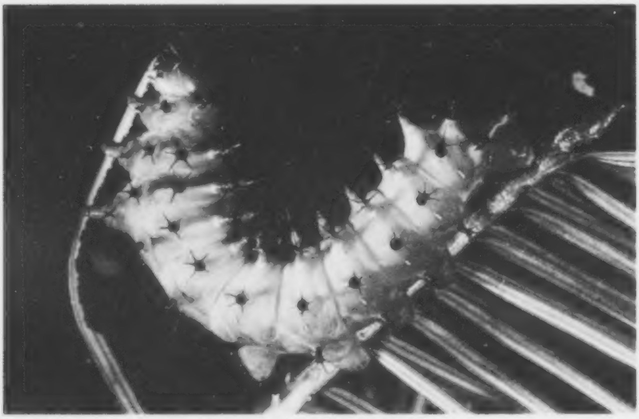
Bionomics: This species overwinters as a pupa in a sac-like cocoon attached to a twig. Adults emerge May to June, and lay 250 to 350 eggs singly or in small groups on host foliage. Larvae are present June to August. Pupation occurs in August.

Damage: The ceanothus silk moth is an uncommon, solitary defoliator.

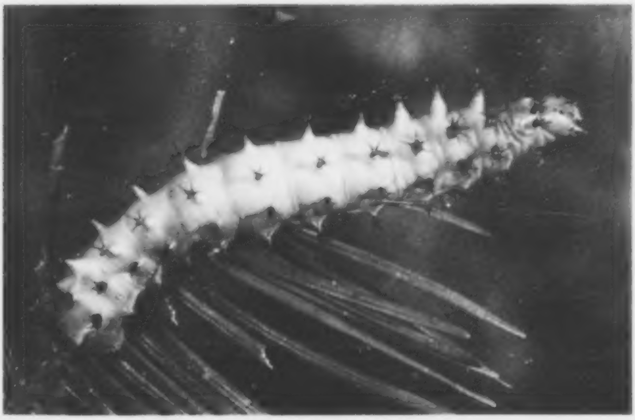
Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorsal view of prepupal larva on Douglas-fir



Lateral view of penultimate-instar larva on Douglas-fir



Dorso-lateral view of mature larva on Douglas-fir

Acleris gloverana (Walsingham)
Western blackheaded budworm

Hosts: Principal hosts are western hemlock, Engelmann spruce, white spruce, subalpine fir, amabilis fir and Douglas-fir; other hosts include grand fir, Sitka spruce, black spruce and mountain hemlock.

Distribution: This species is found throughout British Columbia except east of the Rocky Mountains, where it is replaced by the blackheaded budworm; south to California, and north to southeast Alaska and southwest Yukon.

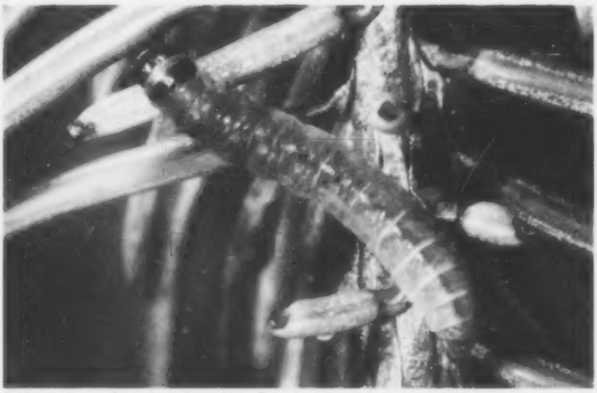
Description: Mature larva up to 16 mm long. Head, brown or black, with a black prothoracic shield. Body, green to yellowish green, without distinct markings.

Bionomics: This species overwinters in the egg stage. Eggs hatch from May to early June. The larvae feed on new foliage, webbing needles together to form protected feeding shelters. Although they usually confine their feeding to current growth, during outbreaks they will feed on old foliage once the new foliage is consumed. Larvae feed until late July to early August, then pupate on twigs within a web made of dead needles. Adults emerge 2 to 3 weeks later, and lay eggs singly on the underside of needles.

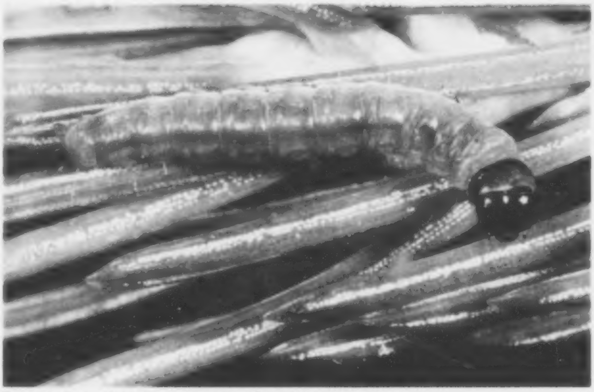
Damage: The western blackheaded budworm is among the most destructive defoliators in British Columbia. Massive outbreaks covering more than 100 000 ha were recorded on Vancouver Island from 1943 to 1944, 1954 to 1957, and 1969 to 1973, and in the Queen Charlotte Islands–North Coast area from 1973 to 1974. Smaller-scale outbreaks were recorded at Masset Inlet from 1943 to 1944, in the Queen Charlotte Islands–North Coast area from 1952 to 1955 and 1985 to 1988; in Upper Arrow–Big Bend from 1965 to 1967; at North Okanagan–Shuswap from 1965 to 1967; at Coquihalla–Hope Slide from 1966 to 1968; on the North Shore Mountains from 1968 to 1970; at Bulkley–Morice from 1987 to 1989; at Winter Harbour–Holberg from 1988 to 1990; on north Vancouver Island from 1996 to 1998; and on the Queen Charlotte Islands from 1996 to 2001.

During outbreaks, the most severe defoliation occurs in the crown; however, in extreme situations the entire tree may be defoliated. Severe defoliation may result in top kill or tree mortality, especially if an outbreak continues over several years.

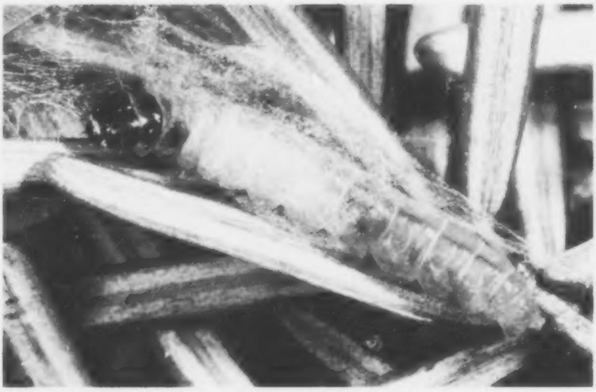
Similar species: *Acleris variana* (p. 246), *Archips packardiana* (p. 250), *Archips tsugana* (p. 252) and *Argyrotaenia occultana* (p. 258). *Acleris gloverana* is most similar to *A. variana*, but has different distribution. *Acleris gloverana* differs from *Archips packardiana*, *A. tsugana* and *Argyrotaenia occultana* in that its head is unmarked rather than having distinct markings on the head capsule.



Dorsal view of mature larva on Engelmann spruce



Dorsal view of mature larva on Engelmann spruce



Dorso-lateral view of mature larva (in feeding shelter) on western hemlock

Acleris variana (Fernald)
Blackheaded budworm

Hosts: Principal hosts are white spruce, subalpine fir and balsam fir.

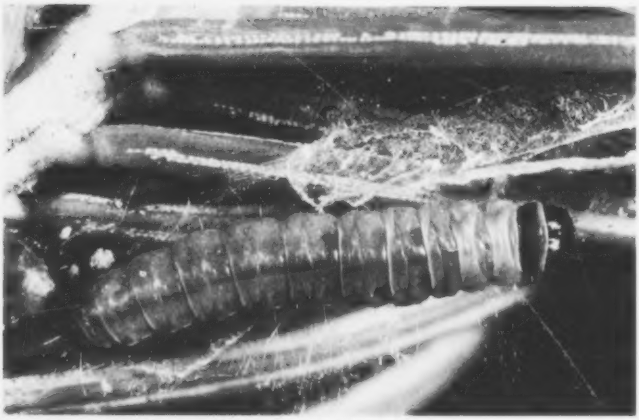
Distribution: Northeast British Columbia east of the Rocky Mountains; north to the Northwest Territories and eastern Yukon, east to Newfoundland, and south to New York. West of the Rocky Mountains, it is replaced by the western blackheaded budworm, *Acleris gloverana*.

Description: Mature larva up to 16 mm long. Head, brown or black, with a black prothoracic shield. Body, green to yellowish green, without distinct markings.

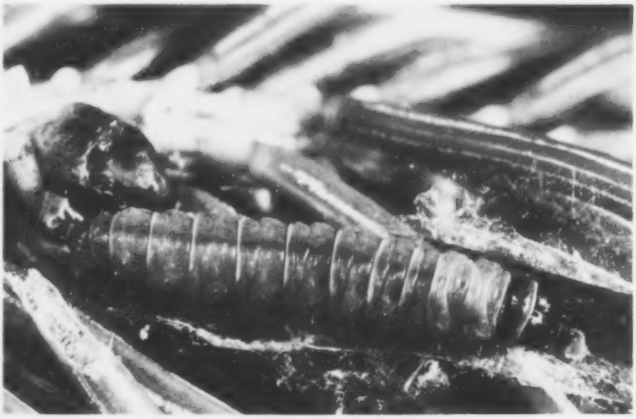
Bionomics: This species overwinters in the egg stage. Eggs hatch from May to early June. The larvae feed on new foliage, webbing needles together to form protected feeding shelters. Although they usually confine their feeding to current growth, during outbreaks they will feed on old foliage once the new foliage is consumed. Larvae feed until late July to early August, then pupate on the twigs within a web made of dead needles. Adults emerge 2 to 3 weeks later, and lay eggs singly on the underside of needles.

Damage: The blackheaded budworm is a common solitary defoliator. Outbreaks have not been recorded in British Columbia.

Similar species: *Acleris gloverana* (p. 244), *Archips packardiana* (p. 250), *Archips tsugana* (p. 252) and *Argyrotaenia occultana* (p. 258). *Acleris variana* is most similar to *A. gloverana*, but has different distribution. *Acleris variana* differs from *Archips packardiana*, *Archips tsugana* and *Argyrotaenia occultana* in that its head is unmarked rather than having distinct markings on the head capsule.



Dorsal view of mature larva on white spruce



Dorso-lateral view of mature larva on white spruce

Archips alberta (McDunnough)

Hosts: Principal host is black spruce; other hosts include white spruce and Engelmann spruce.

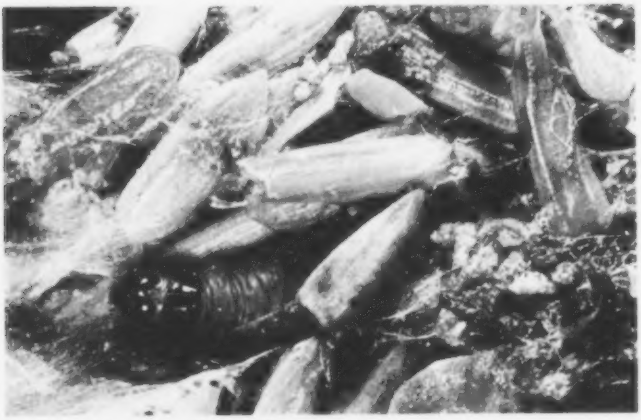
Distribution: Central and northern interior of British Columbia; east to Newfoundland, north to the Yukon and Northwest Territories, and south to New England.

Description: Mature larva up to 15 mm long. Head and prothoracic shield, unmarked black. Body, unmarked greyish green to cream colored; dorsum of each abdominal segment, marked with 2 pairs of grey spots (pinacula).

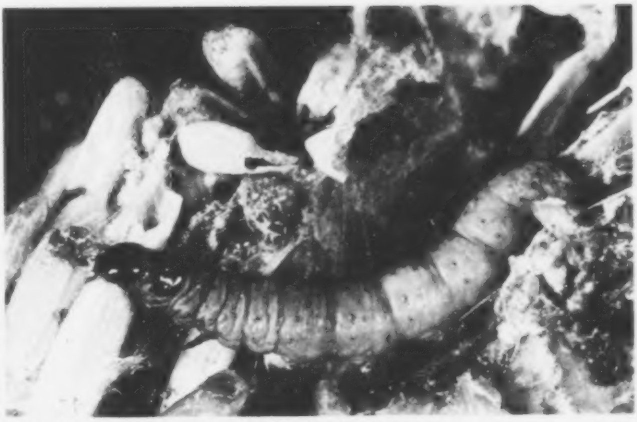
Bionomics: This species overwinters as an early instar larva in a mined needle. In the spring, it continues to mine needles and spins some webbing between adjacent needles, tying them together. Later instars feed on foliage and cones, webbing together a considerable quantity of mined and partly eaten needles, in which the larva often pupates. Pupation occurs mid- to late June. Adults emerge soon after, mate, and lay eggs in the crown of host trees. The larva starts mining needles in late summer. This species is usually found in the crown of black spruce, often together with *Dolichomia thymetusalis* (p. 238), feeding on foliage and cones.

Damage: *Archips alberta* is a relatively uncommon, solitary defoliator. Some damage to the cone crop may occur.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Mature larva in feeding shelter on black spruce



Dorso-lateral view of mature larva on black spruce

Archips packardiana (Fernald)

Hosts: Principal hosts are white spruce and Engelmann spruce; other hosts include black spruce and balsam fir.

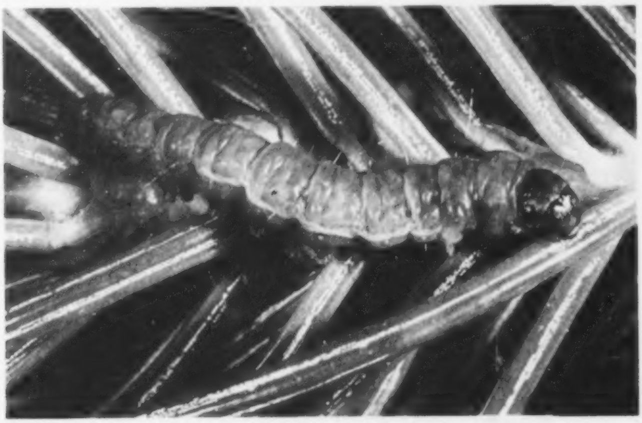
Distribution: Generally distributed throughout the interior of British Columbia south of the Fraser and Skeena River drainages; east to Newfoundland, and south to Maine and Wyoming.

Description: Mature larva up to 18 mm long. Head, yellowish green with dark finger-like markings extending forward. Body, unmarked yellowish green.

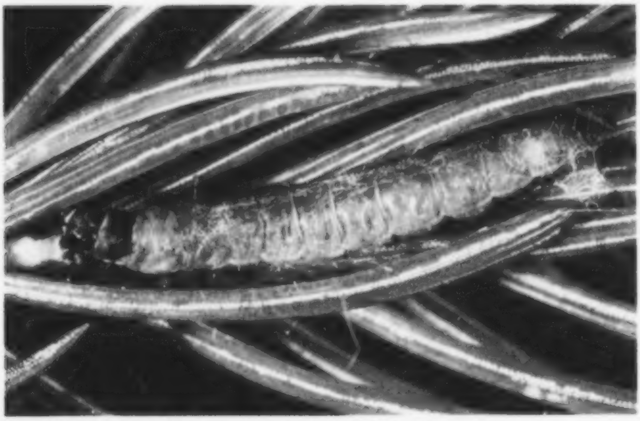
Bionomics: This species overwinters as an early instar larva in a mined needle. In the spring, it mines 4 to 5 new needles and spins webbing between adjacent needles, tying them together. Some frass adheres to the silk, but none is left in the mines. Later-instar larvae feed on new foliage and spin considerable webbing, in which they often pupate. Pupation occurs mid- to late June. Adults emerge soon after, then mate and lay eggs. The newly emerged larva starts mining a current-year needle in late summer, entering from the base and mining about half the length of the needle.

Damage: *Archips packardiana* is a common, innocuous, solitary defoliator.

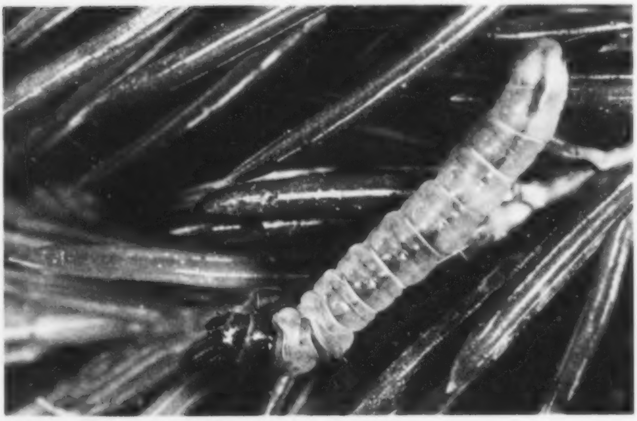
Similar species: *Acleris gloverana* (p. 244), *Acleris variana* (p. 246), *Archips tsugana* (p. 252) and *Argyrotaenia occultana* (p. 258). *Archips packardiana* is most similar to *Argyrotaenia occultana*, but is somewhat larger and occurs much earlier in the year. It differs from *Acleris gloverana* and *Acleris variana* in that it has distinct markings on its head capsule rather than having an unmarked head capsule. Its distribution differs from that of *Archips tsugana*. Although a larva of *Archips striana* (Fernald) was not collected during this study, it is likely to be very similar to *A. packardiana*; *A. striana* appears to be much less common in British Columbia.



Lateral view of mature larva on Engelmann spruce



Dorso-lateral view of mature larva on Engelmann spruce



Dorsal view of mature larva on Engelmann spruce

Archips tsugana (Powell)

Hosts: Principal host is Sitka spruce; also occurs on western hemlock.

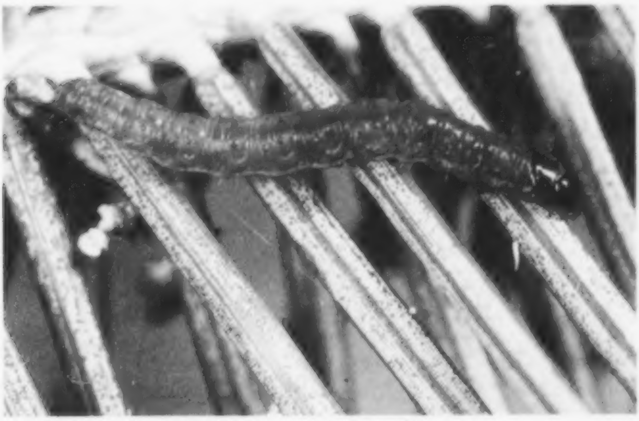
Distribution: South coastal British Columbia; south to coastal Washington.

Description: Mature larva up to 17 mm long. Head, brown with dark finger-like markings extending forward. Body, yellowish green without distinct markings.

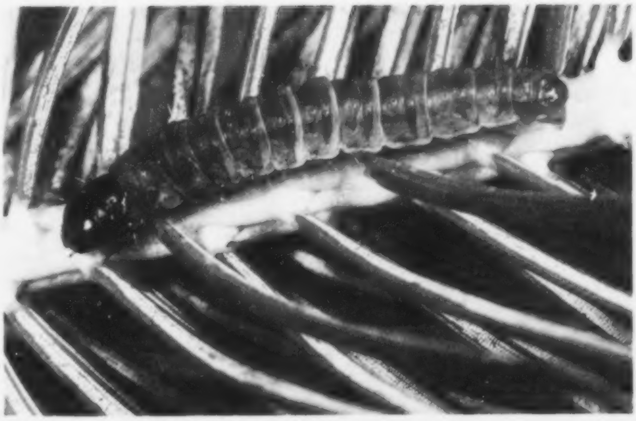
Bionomics: Overwintering stage is not known. Larvae are present July to early August, pupation occurs in August, and adults emerge soon after.

Damage: *Archips tsugana* is an uncommon, solitary defoliator.

Similar species: *Acleris gloverana* (p. 244), *Acleris variana* (p. 246), *Archips packardiana* (p. 250) and *Argyrotaenia occultana* (p. 258). *Archips tsugana* differs from *Acleris gloverana* and *A. variana* in that it has distinct markings on its head capsule rather than having an unmarked head capsule. *Archips tsugana* differs from *Archips packardiana* in that it has a different distribution, and from *Argyrotaenia occultana* in that it occurs much earlier in the year.



Dorso-lateral view of penultimate-instar larva on Sitka spruce



Dorso-lateral view of mature larva on Sitka spruce

Argyrotaenia citrana (Fernald)
Orange tortrix

Hosts: Broad range of coniferous hosts, including Douglas-fir, western hemlock, lodgepole pine, grand fir, Sitka spruce, western redcedar, eastern white-cedar and western yew; also occurs on a broad range of hardwood and herbaceous hosts.

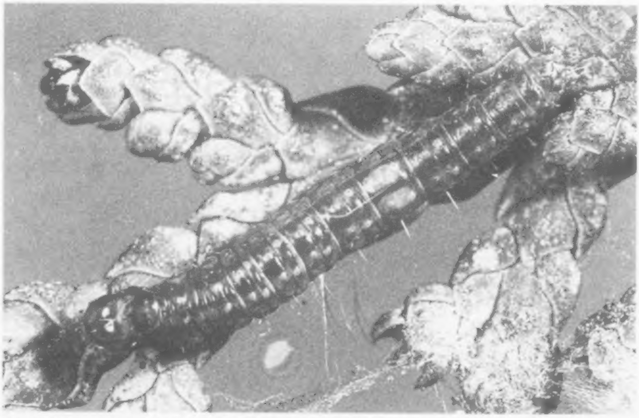
Distribution: South coastal British Columbia; south to California.

Description: Mature larva up to 15 mm long. Head, brownish yellow with black lateral stripes. Body, pale yellowish brown or green. Dorsum, darker, fading laterally to light creamy yellow below the spiracular line. Dorsum of each abdominal segment is marked with 2 pairs of subdorsal creamy yellow spots (pinacula).

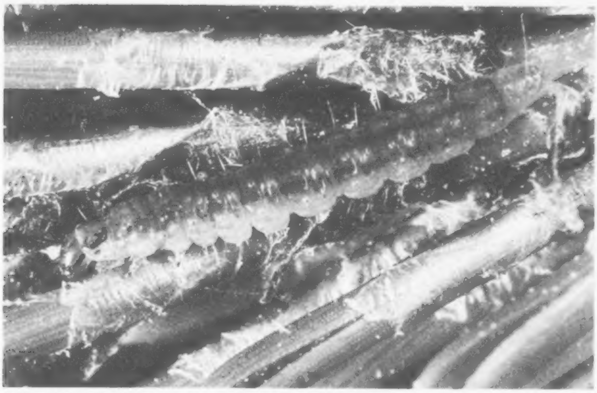
Bionomics: This species overwinters in the larval stage. Larvae are present April to May. Pupation occurs in May or June, and adults emerge in July. In nurseries and particularly in greenhouses, this species appears to complete several generations in a year.

Damage: The orange tortrix is uncommon in natural forest stands, but is common on conifers planted in urban settings. It can cause economic damage in conifer nursery production.

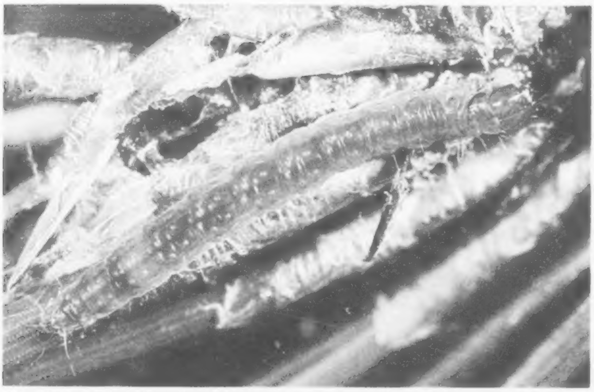
Similar species: *Ditula angustiorana* (p. 274). *Argyrotaenia citrana* differs from *D. angustiorana* in that the larva is brownish yellow or green rather than yellowish green, and the pinacula are more clearly defined.



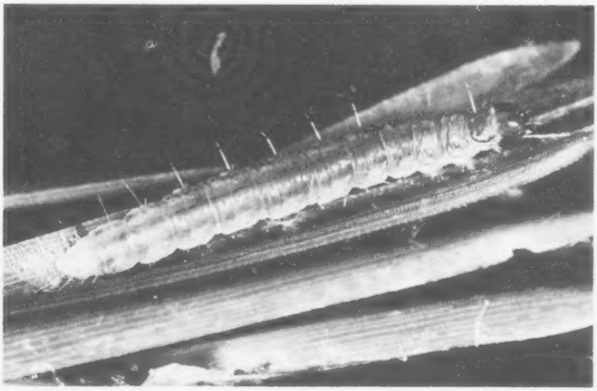
Dorsal view of mature larva (green form) on eastern white-cedar



Lateral view of mature larva on lodgepole pine



Dorsal view of mature larva on lodgepole pine



Dorsal view of mature larva on lodgepole pine

Argyrotaenia dorsalana (Dyar)

Hosts: Principal host is Douglas-fir; also occurs on western hemlock.

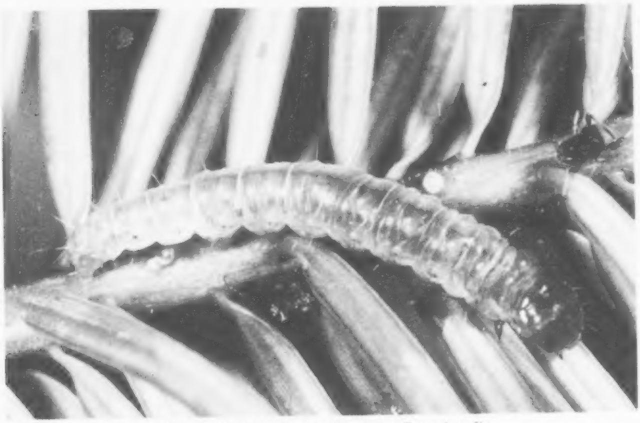
Distribution: Southern British Columbia; south to California and Utah.

Description: Mature larva up to 17 mm long. Head, yellowish green with black wedge-shaped markings on cheeks. Body, yellowish green; dark green middorsal pinstripe; dorsum of each abdominal segment is marked with 2 pairs of faint yellow spots (pinacula).

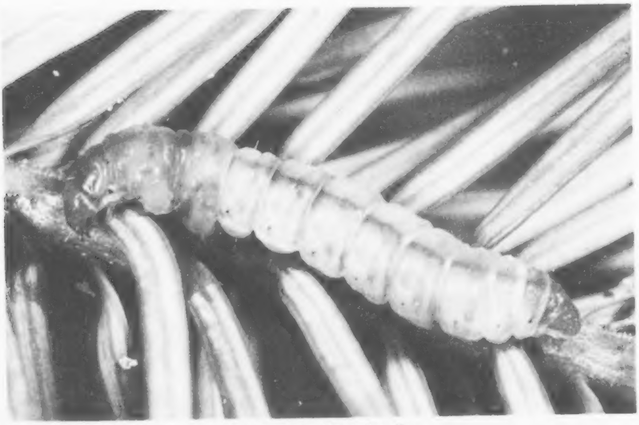
Bionomics: Overwintering stage is not known. Larvae are present from early May to June, pupation occurs in June, and adults emerge in July.

Damage: *Argyrotaenia dorsalana* is a common, innocuous, solitary defoliator.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of penultimate-instar larva on Douglas-fir



Dorso-lateral view of prepupal larva on Douglas-fir

Argyrotaenia occultana Freeman

Hosts: Principal hosts in British Columbia are white spruce, Engelmann spruce and Douglas-fir.

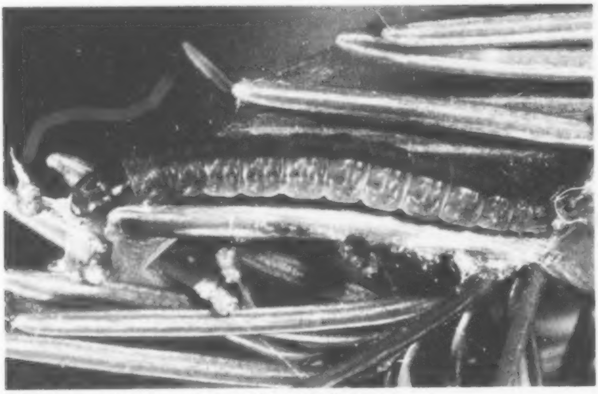
Distribution: Interior of British Columbia; east to Newfoundland, north to the Yukon, and south to Kentucky and Oregon.

Description: Mature larva up to 17 mm long. Head, yellowish green with brown to dark brown finger-like markings extending forward. Body, yellowish green with dark green middorsal stripe.

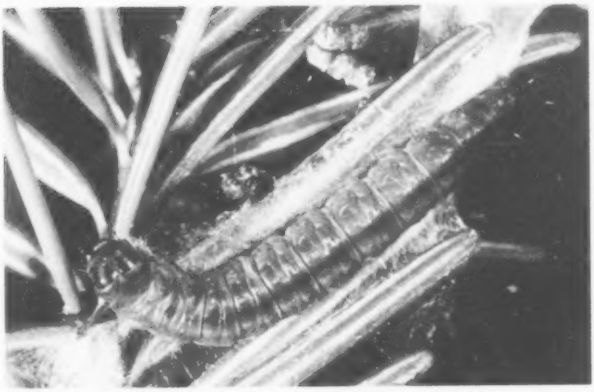
Bionomics: This species overwinters in the pupal stage. Adults emerge late June to early July. Larvae web needles and are present from July to September. Pupation occurs in September.

Damage: *Argyrotaenia occultana* is an uncommon, solitary defoliator.

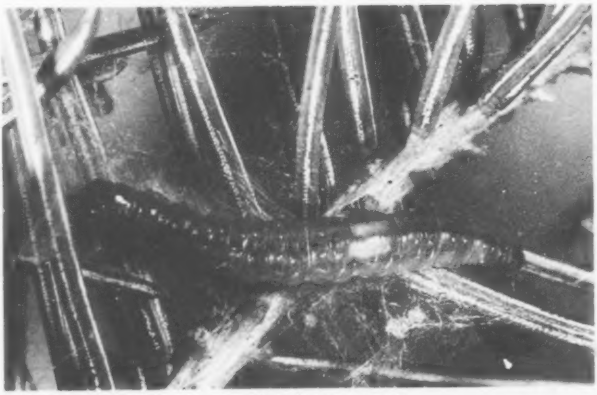
Similar species: *Acleris gloverana* (p. 244), *Acleris variana* (p. 246), *Archips packardiana* (p. 250) and *Archips tsugana* (p. 252). *Argyrotaenia occultana* occurs much later in the year than these species.



Dorsal view of mature larva on Douglas-fir



Dorsal view of mature larva on Douglas-fir



Dorsal view of mature larva on Engelmann spruce

Argyrotaenia tabulana Freeman
Jack pine tube moth

Hosts: Principal host in British Columbia is lodgepole pine; it also occurs on whitebark pine. Its principal host outside British Columbia is jack pine.

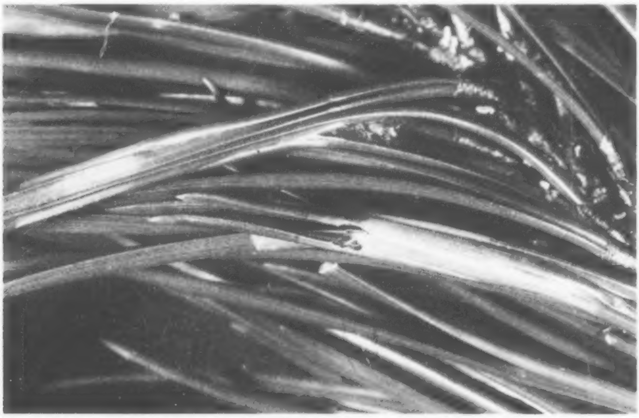
Distribution: Throughout the interior of British Columbia south of 56° latitude; east to Quebec, and south to Connecticut and Washington.

Description: Mature larva up to 15 mm long. Head, pale brownish yellow. Body, pale green with a dark green middorsal pinstripe; dorsum of each abdominal segment is marked with a pair of dark green spots (pinacula).

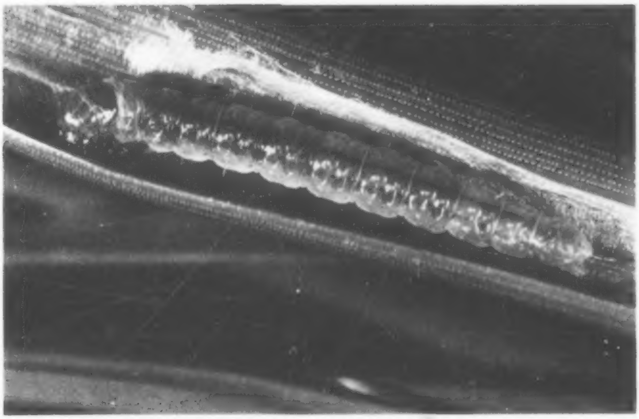
Bionomics: This species overwinters in the pupal stage. Adults emerge from May to June, mate, and lay eggs on host foliage. The eggs hatch soon after. The newly emerged larva initially mines needles, but as it matures it ties up to 7 needles together to form a tube, within which the larva feeds. The mature larva drops to the ground in August and pupates in a flimsy cocoon among the ground litter.

Damage: Feeding by *Argyrotaenia tabulana* causes affected needles in feeding shelters to dry out and turn reddish brown. Noticeable damage occasionally occurs, but is unlikely to cause growth loss.

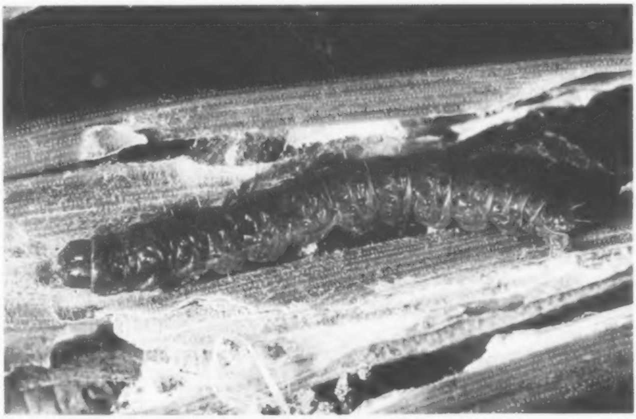
Similar species: No similar species occur on lodgepole pine in British Columbia.



Larval feeding shelters on lodgepole pine



Dorsal view of penultimate-instar larva on lodgepole pine



Dorso-lateral view of mature larva on lodgepole pine

Choristoneura biennis Freeman
Two-year-cycle budworm

Hosts: Principal hosts are Engelmann spruce, white spruce and subalpine fir.

Distribution: This species occurs in higher-elevation stands in the Kootenays, and in the central and northern interior of British Columbia; east to mountainous western Alberta, and north to the Yukon.

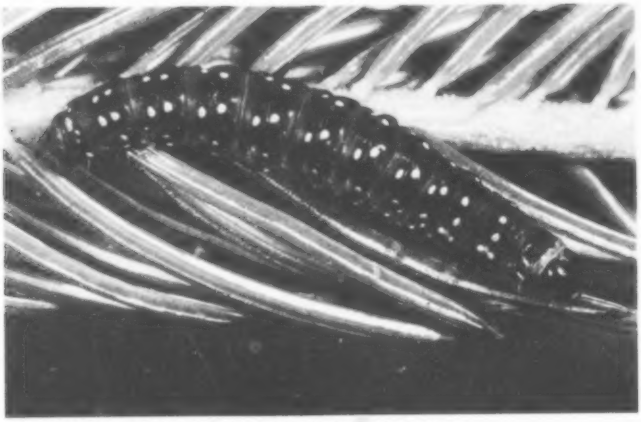
Description: Mature larva robust, up to 25 mm long. Head, black or brown with black vertices. Body, dark brown; dorsum of each abdominal segment is marked with 2 pairs of ivory white spots.

Bionomics: This species overwinters as a second-instar larva protected in a hibernaculum (silken shelter) on a branch or trunk. Larvae become active in late May to early June, mine needles and buds for 3 to 4 weeks, then spin hibernacula and enter a second diapause to overwinter as fourth-instar larvae. Larval development is completed during the spring of the second year, when the greatest amount of feeding occurs. Pupation occurs in July and lasts about 2 weeks. Moths emerge from mid-July to early August, then mate and lay up to 150 eggs in several masses on needles of the host tree. Eggs hatch within 2 weeks. The newly emerged larva does not feed, but crawls to a sheltered location, forms a small hibernaculum, and molts.

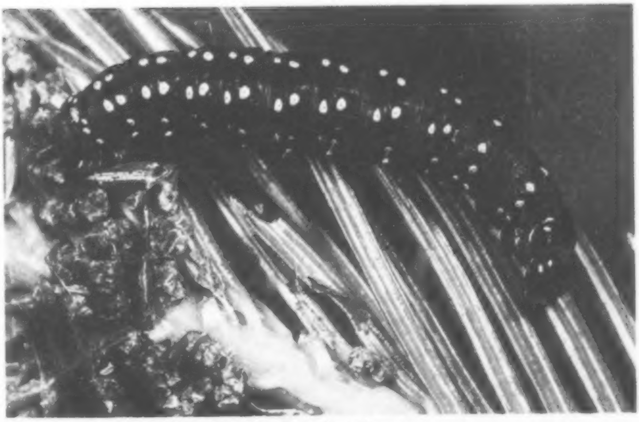
Damage: In the southern part of the budworm's range (Purcell and Monashee Mountains), heavier defoliation occurs in odd-numbered years, whereas in the central interior part of the range, more severe damage occurs in even-numbered years. Outbreaks were recorded in the Monashee Mountains and Kootenay National Park from 1942 to 1957; in the Strathnaver to McGregor River area and from McBride to Findlay Forks from 1950 to 1964; along the North White River in 1972; in the Spillimacheen River valley from 1975 to 1981; in the White River drainage from 1977 to 1981; and in the Holmes River, Bowron River and Willow River valleys from 1978 to 1982.

Repeated defoliation by this budworm causes top kill, tree mortality, and loss of timber volume of host trees in affected forest ecosystems.

Similar species: *Choristoneura occidentalis* (p. 268), *C. fumiferana* (p. 264) and *C. orae* (p. 270). *Choristoneura biennis* differs in that the mature larva is considerably larger and darker than those of the other species and, in a series, can be recognized quite easily. It has a 2-year life cycle, unlike the 1-year life cycle typical of other budworm species. It also has different distribution.



Dorso-lateral view of mature larva on Engelmann spruce



Dorso-lateral view of prepupal larva on Engelmann spruce

Choristoneura fumiferana (Clemens)
Spruce budworm

Hosts: Principal hosts are white spruce and subalpine fir; other hosts include jack pine, lodgepole pine, balsam fir, black spruce and tamarack.

Distribution: Northeast British Columbia (east of the Rocky Mountains); east to Newfoundland, north to the Northwest Territories, and south to Maine.

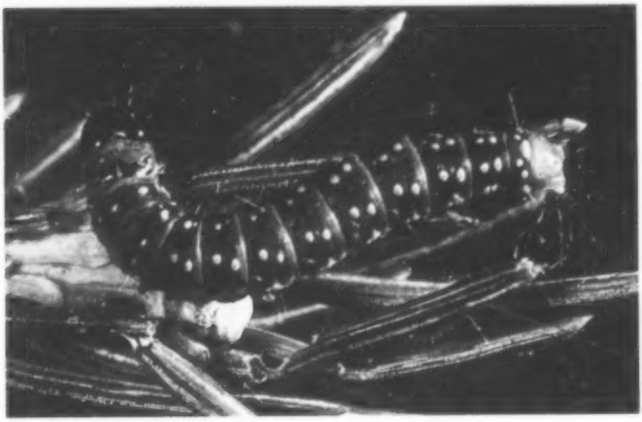
Description: Mature larva up to 25 mm long. Head, unmarked brown to black. Body, rusty brown to dark brown; dorsum of each abdominal segment is marked with 2 pairs of ivory white spots.

Bionomics: This species overwinters as a second-instar larva protected in a hibernaculum (silken shelter) on a branch or trunk. The larvae become active in April and initially mine needles and buds. As the buds swell in May, the larvae feed on the expanding needles. Eventually they form a loose webbing in the new foliage around the feeding sites. Mature larvae pupate within this webbing in late June or early July, and adults emerge 12 to 18 days later. After mating, the female lays up to 150 eggs in shingle-like masses on the undersides of needles. The eggs hatch within 12 days. The newly emerged larva does not feed, but crawls to a sheltered location, forms a small hibernaculum, and molts.

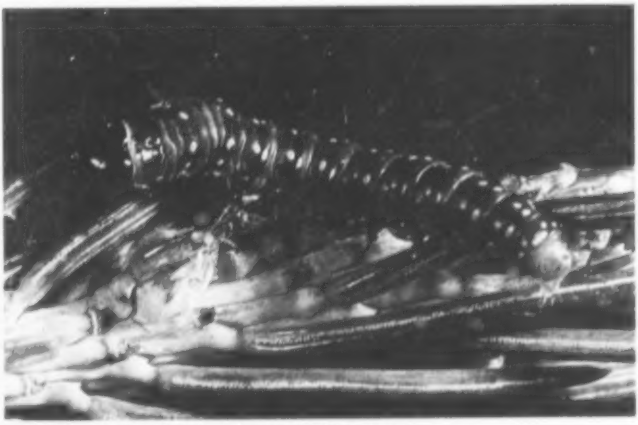
Damage: The spruce budworm is the most destructive defoliator in Canada, but because of its limited distribution in British Columbia is not as serious a problem in this province. Nonetheless, sustained outbreaks resulting in defoliation covering more than 400 000 ha in some years were recorded throughout much of northeast British Columbia during the period from 1984 to 2003. Areas chronically infested during this period included the Fort Nelson and Liard River valleys, as well as the Coal, Smith, Muskwa, Beaver and Prophet River drainages.

Damage caused by budworm feeding includes killing of mined buds by early instar larvae and stripping of current-year foliage primarily in the upper crown by mid- to late-instar larvae. In severe infestations, old foliage may also be destroyed. Budworms are wasteful feeders, often consuming only parts of needles and chewing them off at their bases. By midsummer, heavily infested trees appear scorched and have heavily defoliated upper crowns and branch tips. Severe defoliation over several consecutive years results in reduced incremental growth, top dieback, bole deformity and tree mortality. Trees weakened by budworm defoliation may be killed by bark beetles during or following budworm infestations.

Similar species: *Choristoneura biennis* (p. 262), *C. occidentalis* (p. 268) and *C. orae* (p. 270). *Choristoneura fumiferana* can be distinguished from these species by its different distribution.



Dorsal view of mature larva on white spruce



Dorso-lateral view of mature larva on white spruce

Choristoneura lambertiana (Busck)

Hosts: Principal host is lodgepole pine; also occurs on ponderosa pine and limber pine.

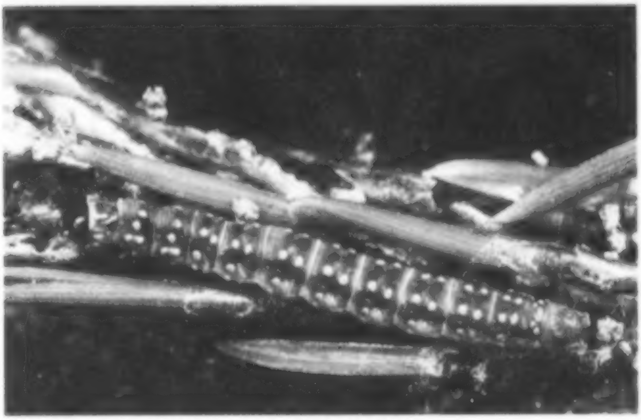
Distribution: Southern interior of British Columbia south of 50° latitude; south to California.

Description: Mature larvae up to 18 mm long. Head, unmarked brown. Body, rusty brown; dorsum of each abdominal segment is marked with 2 pairs of white spots.

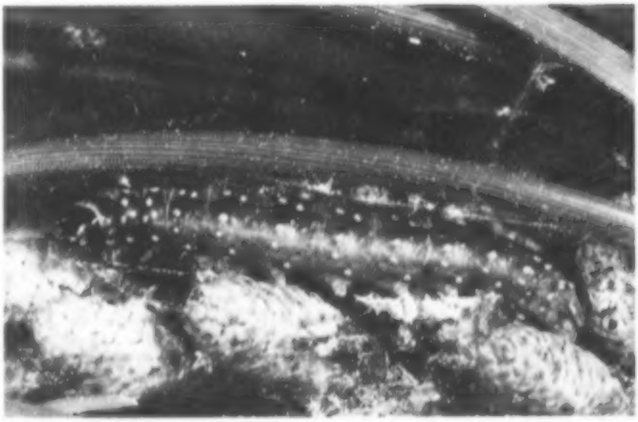
Bionomics: This species overwinters as a second-instar larva protected in a hibernaculum on a branch. Emergence is usually delayed until buds and staminate cones have developed sufficiently to be a suitable food source. Early emerging larvae may mine needles. Larvae feed primarily on staminate cones, but will also feed on female cones and on foliage along the elongating shoot. Larvae feed for 4 to 6 weeks. The pupal period lasts approximately 2 weeks; adult emergence begins in mid-July and extends through the end of July. Eggs are deposited in clusters on the host tree's needles in late July to early August. The clusters consist of 2 rows of pale green eggs, laid in an overlapping fashion along the axis of the needle. As many as 83 eggs occur in a cluster; the mean is 22. The eggs hatch within 2 weeks. First-instar larvae migrate from the needles to protected locations on the branches, and spin hibernacula.

Damage: A sustained outbreak of *Choristoneura lambertiana* occurred in the Screw Creek area east of Yahk from 1963 to 1965. This species primarily feeds on the reproductive structures of the host plant. Cones are often completely excavated and aborted.

Similar species: This species is similar to other conifer-feeding *Choristoneura* spp. (p. 262–270) but is restricted to pines in the southernmost interior of British Columbia.



Dorso-lateral view of mature larva on lodgepole pine



Lateral view of mature larva on lodgepole pine

Choristoneura occidentalis Freeman
Western spruce budworm

Hosts: Principal host is Douglas-fir; other hosts include amabilis fir, grand fir, subalpine fir, western larch, Engelmann spruce and white spruce.

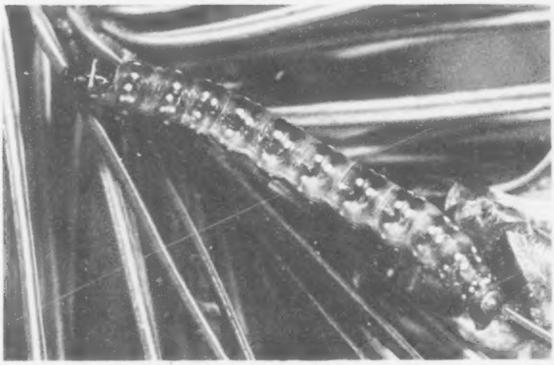
Distribution: Throughout much of the range of the principal host both on the south coast and in the interior; south to California and New Mexico.

Description: Mature larva up to 25 mm long. Head, unmarked brown to black. Body, pale yellowish brown to dark brown, sometimes with a distinct greenish tinge; dorsum of each abdominal segment is marked with 2 pairs of ivory white spots.

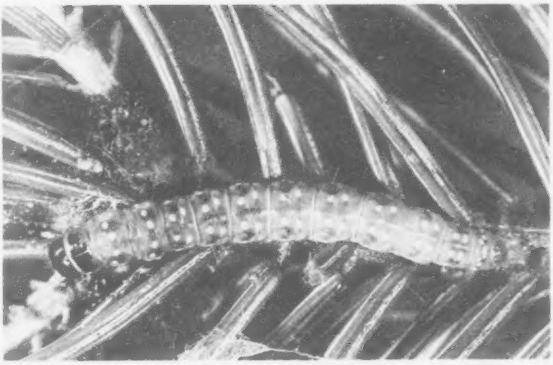
Bionomics: This species overwinters as a second-instar larva protected in a hibernaculum (silken shelter) on a branch or trunk. The larvae become active in April and initially mine needles and buds. As the buds swell in May, the larvae feed on the expanding needles. Eventually they form a loose webbing in the new foliage around the feeding sites. Mature larvae pupate within this webbing in late June or early July. Adults emerge 12 to 18 days later. After mating, the female lays up to 150 eggs in shingle-like masses on the undersides of needles. The eggs hatch within 12 days. The newly emerged larva does not feed, but crawls to a sheltered location, forms a small hibernaculum, and molts.

Damage: The western spruce budworm is the most destructive defoliator in British Columbia. Sustained outbreaks resulting in defoliation covering more than 100 000 ha occurred in the Fraser River Canyon–Lillooet–Pemberton area from 1949 to 1958, and again over a much increased area including the Pemberton, Fraser River Canyon, Thompson, Shuswap, Adams Lake, Merritt and south Okanagan areas from 1970 to 2001. Damage caused by budworm feeding includes killing of mined buds by early instar larvae and stripping of current-year foliage primarily in the upper crown by mid- to late-instar larvae. In severe infestations, old foliage may also be destroyed. Budworms are wasteful feeders, often consuming only parts of needles and chewing them off at their bases. By midsummer, heavily infested trees appear scorched and have heavily defoliated upper crowns and branch tips. Severe defoliation over several consecutive years results in reduced incremental growth, top dieback, bole deformity and, in some cases, tree mortality. Trees weakened by budworm defoliation may be killed by bark beetles during or following budworm infestations.

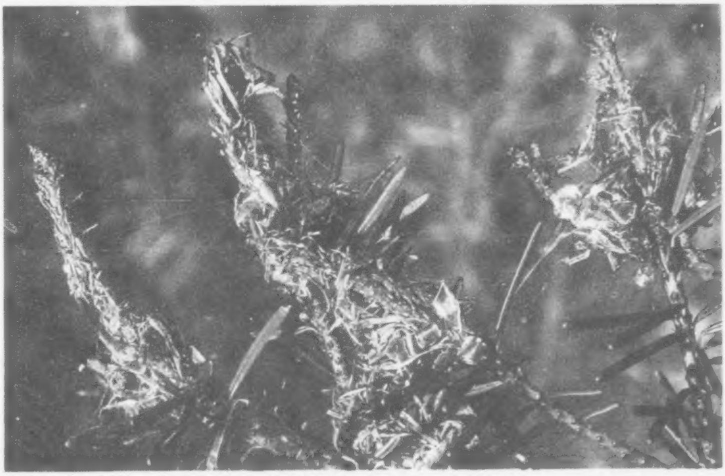
Similar species: *Choristoneura biennis* (p. 262), *C. fumiferana* (p. 264) and *C. orae* (p. 270). *Choristoneura occidentalis* differs from these species by host preference (Douglas-fir) and distribution (low- to mid-elevation forests in southern British Columbia).



Dorso-lateral view of mature larva on Douglas-fir



Dorsal view of mature larva (light-colored form) on Douglas-fir



Typical feeding damage on Douglas-fir

Choristoneura orae Freeman

Hosts: Principal hosts are Sitka spruce, amabilis fir and alpine fir; also occurs on western hemlock.

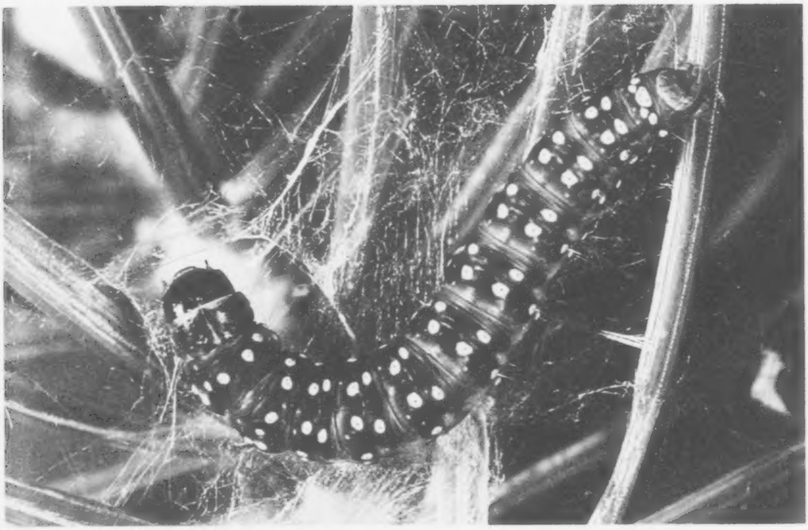
Distribution: North coastal British Columbia and in the rain shadow of the coastal mountains in northwestern British Columbia and southwest Yukon.

Description: Mature larva up to 25 mm long. Head, unmarked brown to black. Body, pale to dark brown, sometimes with a distinct greenish tinge; dorsum of each abdominal segment is marked with 2 pairs of ivory white spots.

Bionomics: This species overwinters as a second-instar larva protected in a hibernaculum (silken shelter) on a branch or trunk. The larvae become active in April and initially mine needles and buds. As the buds swell in May, the larvae feed on the expanding needles. Eventually they form a loose webbing in the new foliage around the feeding sites. Mature larvae pupate within this webbing in late June or early July. Adults emerge 12 to 18 days later. After mating, the female lays up to 150 eggs in shingle-like masses on the undersides of needles. The eggs hatch within 12 days. The newly emerged larva does not feed, but crawls to a sheltered location, forms a small hibernaculum, and molts.

Damage: *Choristoneura orae* is a common and occasionally destructive solitary defoliator. An outbreak causing light defoliation across 2800 ha occurred in the Kitimat valley in 1984.

Similar species: *Choristoneura biennis* (p. 262), *C. fumiferana* (p. 264) and *C. occidentalis* (p. 268). *Choristoneura orae* can be distinguished from these species by host preference (Sitka spruce, amabilis fir and alpine fir) and distribution (north coastal British Columbia).



Dorsal view of mature larva on Sitka spruce

Clepsis persicana Fitch

Hosts: Principal coniferous hosts are Douglas-fir, subalpine fir, lodgepole pine and Engelmann spruce; other hosts include alder, apple, birch, willow and maple.

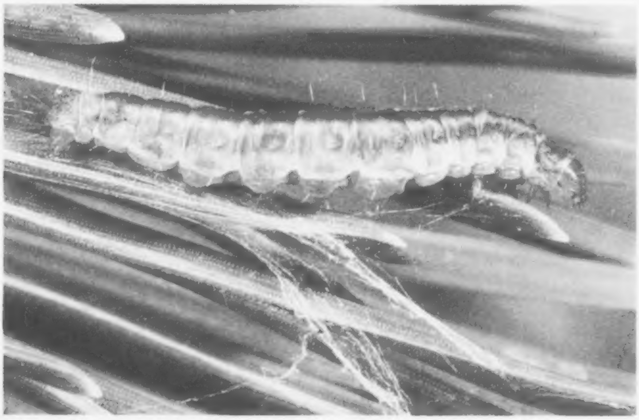
Distribution: Throughout British Columbia; east to Newfoundland, north to the Yukon, and south to Virginia and California.

Description: Mature larva up to 18 mm long. Head, brownish yellow, with dark ocellar area and dark lateral dash. Body, slender, yellowish green, with olive green middorsal and subdorsal stripes.

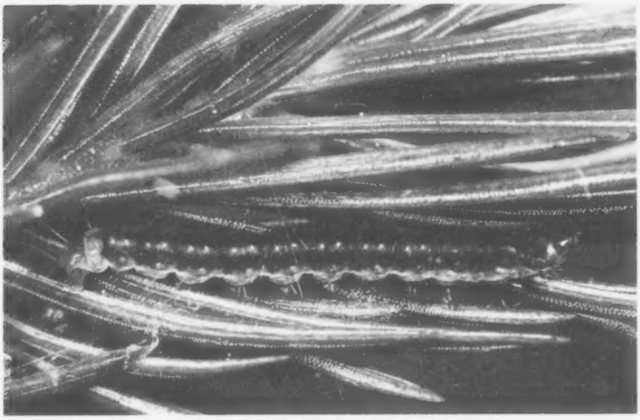
Bionomics: This species overwinters in the larval stage. Larval feeding resumes in spring and continues until June. Pupation occurs in June, and adults emerge from June to July. Eggs are laid in shingle-like masses on host foliage. The eggs hatch in 10 to 12 days. Larvae feed until the onset of cold weather.

Damage: *Clepsis persicana* is a common, innocuous, solitary defoliator.

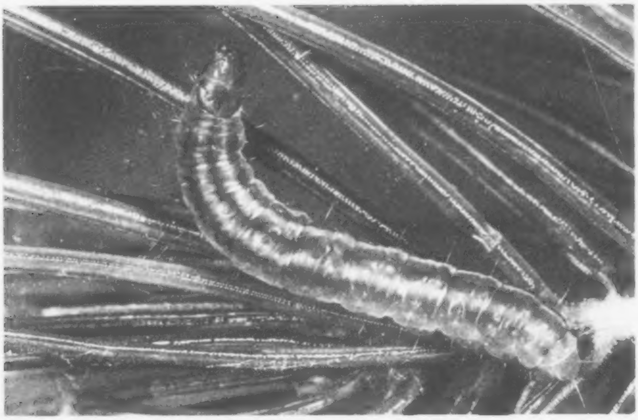
Similar species: No similar species occur on coniferous hosts in British Columbia.



Lateral view of mature larva on lodgepole pine



Lateral view of penultimate-instar larva on Engelmann spruce



Dorso-lateral view of mature larva on Engelmann spruce

Ditula angustiorana (Haworth)

Hosts: Principal coniferous hosts are Douglas-fir, western yew and English yew; other hosts include Garry oak and apple.

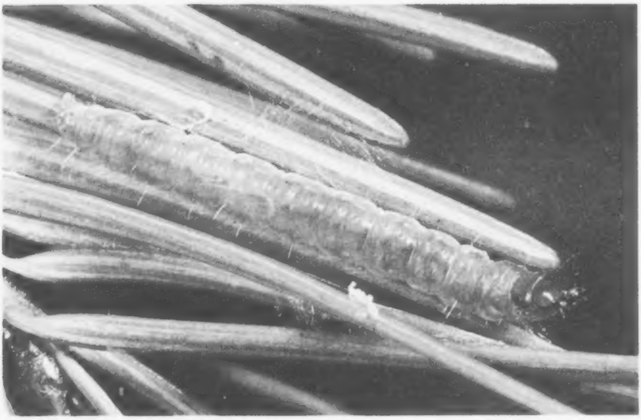
Distribution: Introduced European species. South coastal British Columbia; south along the coast to California. Old World distribution includes most of Europe.

Description: Mature larva up to 14 mm long. Head, brownish yellow; black bar on cheek and dark pigmentation in ocellar area. Body, yellowish green, dorsally fading to creamy yellow below the spiracular line. Faint middorsal stripe.

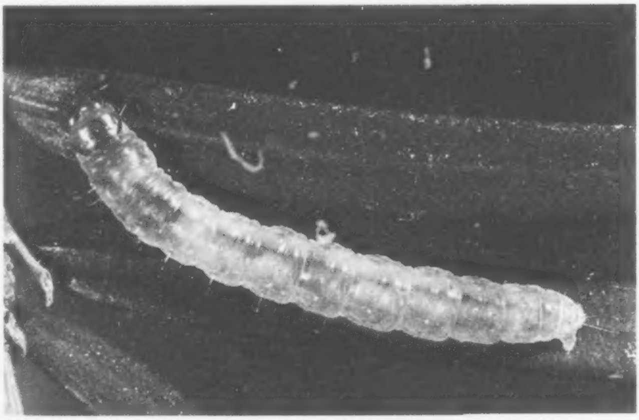
Bionomics: This species overwinters as a young larva. Larval feeding resumes in spring and continues until June. Pupation occurs in June, and adults emerge from June to July. Eggs are laid in shingle-like masses on host foliage.

Damage: *Ditula angustiorana* is a common, innocuous, solitary defoliator.

Similar species: *Argyrotaenia citrana* (p. 254). *Ditula angustiorana* differs in that the larva is yellowish green and the pinacula are somewhat obscure, whereas *A. citrana* is brownish yellow or green and its pinacula are more clearly defined.



Dorsal view of mature larva on Douglas-fir



Dorsal view of mature larva on English yew

Epinotia hopkinsana (Kearfott)

Hosts: Sitka spruce and lodgepole pine.

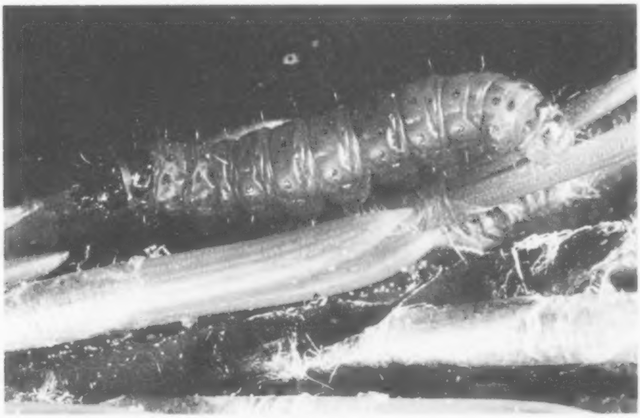
Distribution: Coastal British Columbia; south to California.

Description: Mature larva up to 10 mm long. Head, reddish brown; broad dark lateral bar on cheek and dark pigmentation in ocellar area. Prothoracic shield, amber to brown. Body, dirty white to purplish brown; dorsum of each abdominal segment, marked with 2 pairs of grey spots (pinacula).

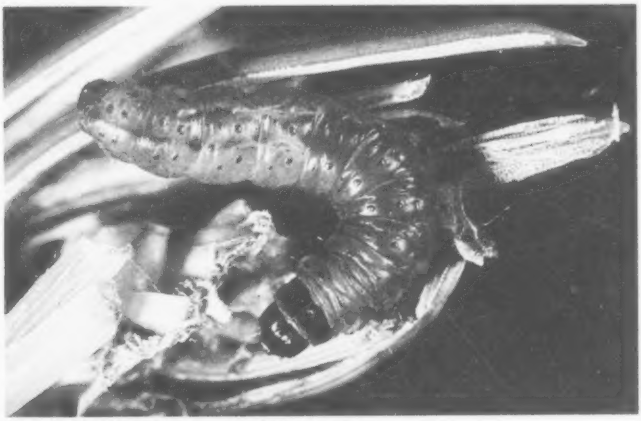
Bionomics: This species overwinters as a young larva, usually in a mined needle. In early spring (April to May), the larva leaves the mined needle and feeds on swelling buds, new growing shoots and conelets. Larvae feed until early June. Pupation occurs at the feeding site in June. Adults emerge in July, mate, and lay eggs on new buds.

Damage: *Epinotia hopkinsana* causes relatively minor damage to newly flushed shoots of lodgepole pine and Sitka spruce.

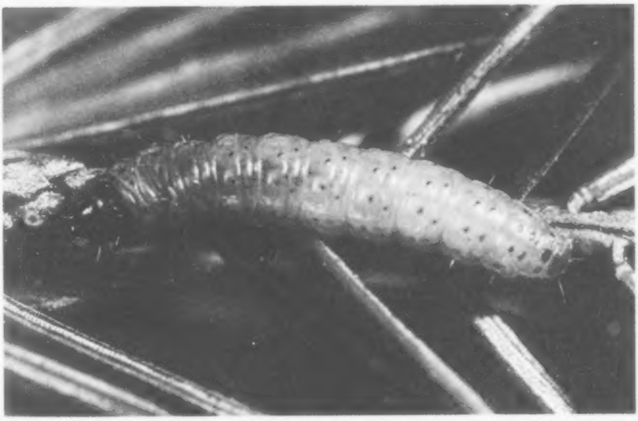
Similar species: *Zeiraphera canadensis* (p. 292), *Z. pacifica* (p. 298) and *Z. vancouverana* (p. 302). Cream-colored *E. hopkinsana* specimens can be distinguished from these *Zeiraphera* species by its more clearly defined pinacula. No similar species occur on lodgepole pine in British Columbia.



Lateral view of mature larva on lodgepole pine



Dorsal view of mature larva on Sitka spruce



Dorsal view of mature larva on Sitka spruce

Epinotia nanana (Treitschke)
European spruce needleminer

Hosts: White spruce, Engelmann spruce, Sitka spruce, Colorado spruce and Norway spruce.

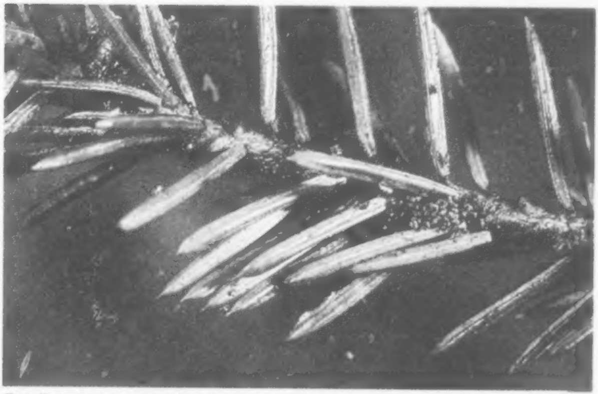
Distribution: Introduced Eurasian species. South coastal British Columbia; Ontario and Quebec, and south to Maine and Ohio. The Eurasian distribution includes north and central Europe, east to Russia and Mongolia.

Description: Mature larva 8 mm long. Head and prothoracic shield, black. Body, light brown; dorsum of each abdominal segment, marked with 2 pairs of dark spots (pinacula). Anal plate, medium brown.

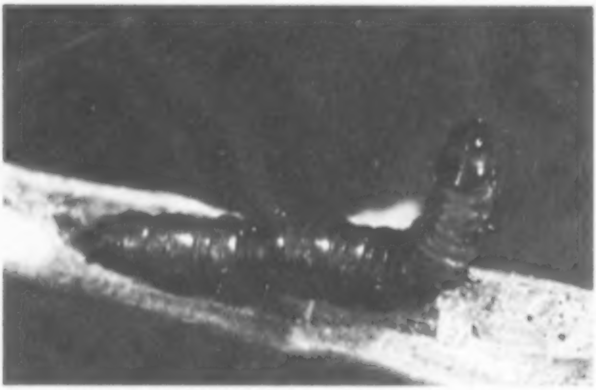
Bionomics: This species overwinters as a mid-instar larva in a mined needle. The larva resumes feeding in April, mining 4 to 10 needles from base to apex, and spinning loose silk webbing among adjacent mined needles. As the larva nears maturity in late April, it creates a frass-covered silken tube at the base of the mined needles. Pupation occurs in May, either in this silken tube or in a cocoon located in the debris beneath the tree. Adults emerge in June, mate and lay eggs on host foliage. The eggs hatch soon after, and the larvae mine needles from late summer into fall.

Damage: The European spruce needleminer causes only minor aesthetic damage to infested ornamental spruce trees in British Columbia.

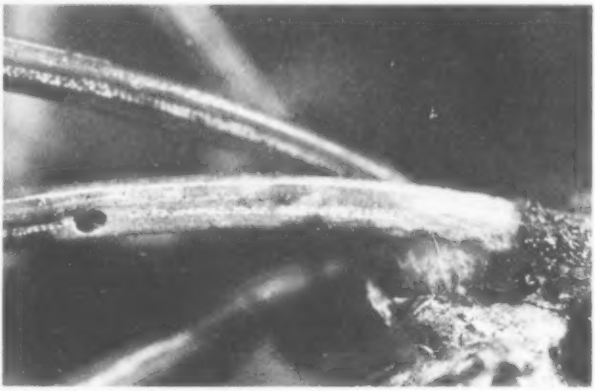
Similar species: No similar species occur on spruce in British Columbia.



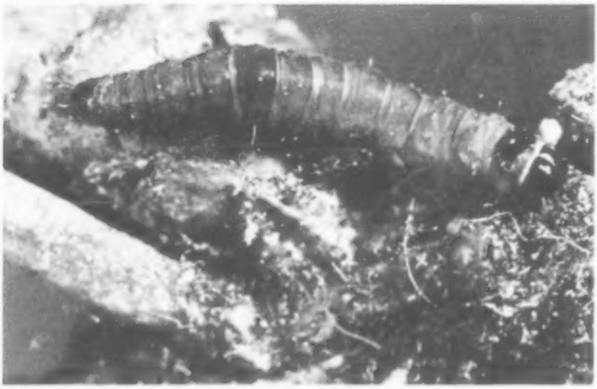
Feeding damage on Engelmann spruce



Dorso-lateral view of mid-instar larva in mined needle on Engelmann spruce



Mined needle on Engelmann spruce



Dorso-lateral view of mature larva on Engelmann spruce

Epinotia radicana (Heinrich)
Spruce tip moth

Hosts: Principal hosts are Engelmann spruce, white spruce and Douglas-fir; other hosts include subalpine fir, grand fir, Sitka spruce and black spruce.

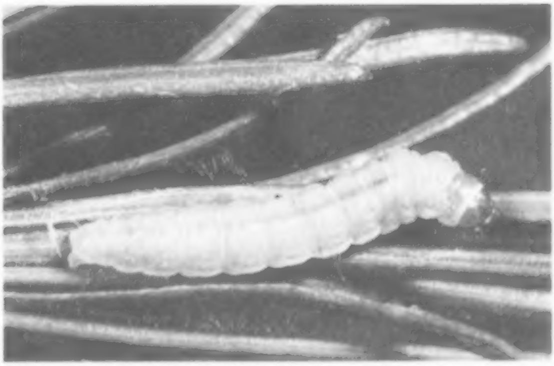
Distribution: Throughout British Columbia; east to Newfoundland, north to the Yukon, and south to New England and California.

Description: Mature larva up to 9 mm long. Head, unmarked brown. Body, pale yellow to reddish pink above spiracular line and creamy yellow below. Diffuse orange–brown to orange–red middorsal stripe is visible on pale specimens.

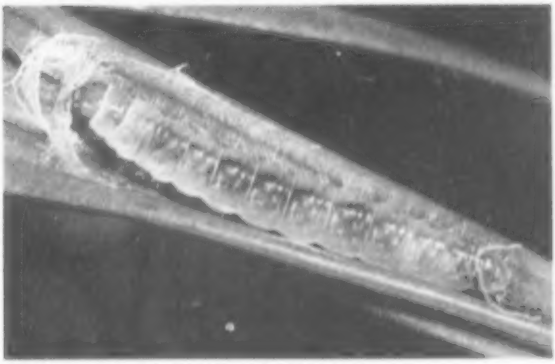
Bionomics: This species overwinters in the egg stage. The eggs are laid singly at the base of the needles. Freshly laid eggs are pale green in color, and change to a yellowish orange after a few days. The larvae appear by the end of May and feed on the current year's foliage for about 6 weeks. There are 5 larval instars. The larva pupates in late June or July, either dropping to the ground to spin a cocoon or remaining in the tree taking shelter under the still-adhering bud cap on a damaged shoot of the host. The pupal stage lasts approximately 3 weeks. Adults emerge in August and September and females lay eggs approximately 7 days later.

Damage: The spruce tip moth is a common, solitary defoliator. Noticeable damage to the new flush occasionally occurs on open-grown Engelmann spruce in the central interior.

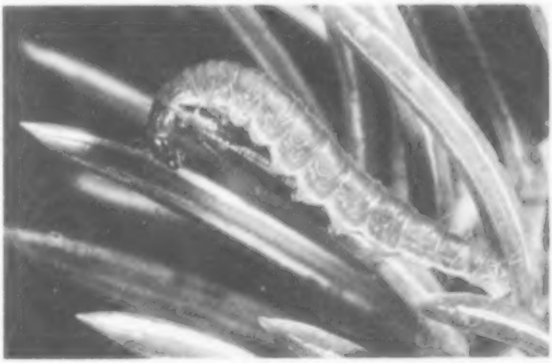
Similar species: No similar species occur on coniferous hosts in British Columbia.



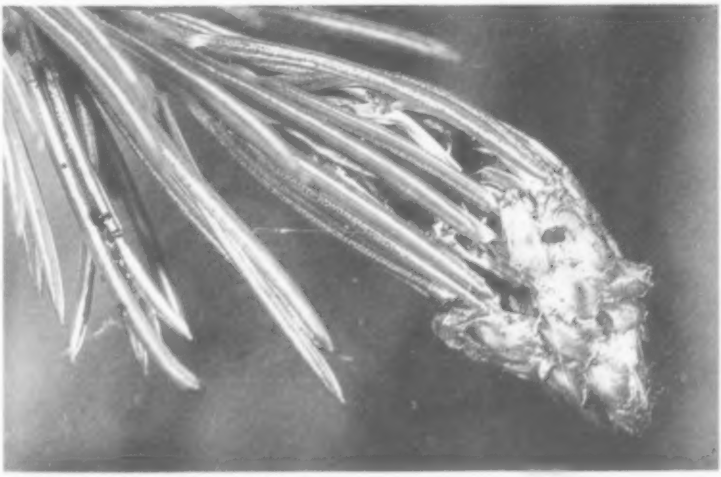
Dorsal view of mature larva (pale form) on western larch



Dorsal view of mature larva on Douglas-fir



Lateral view of mature larva on Engelmann spruce



Feeding damage on Engelmann spruce

Epinotia subviridis (Heinrich)
Cypress leaftier

Hosts: Western redcedar and various ornamental cedar, cypress and juniper species.

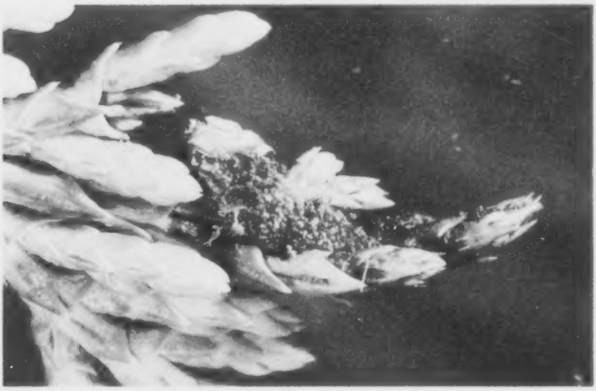
Distribution: South coastal British Columbia; south to California.

Description: Mature larva up to 10 mm long. Head, unmarked brown. Body, reddish brown; dorsum of each abdominal segment, marked with 2 pairs of dark spots (pinacula).

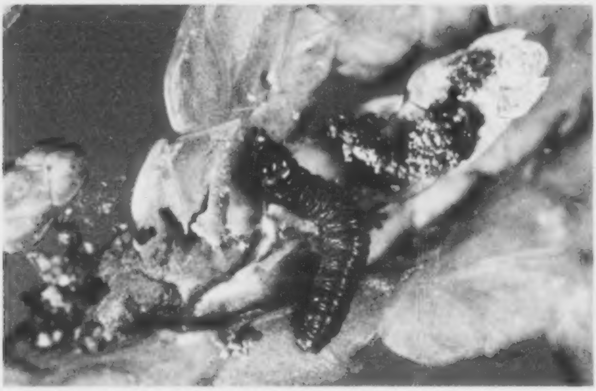
Bionomics: This species overwinters as a small larva in a mined shoot. Larvae resume feeding in March, forming feeding shelters that incorporate frass and gnawed twigs and foliage. Pupation occurs in early June, and adults emerge in July.

Damage: The cypress leaftier occasionally causes noticeable shoot dieback on ornamental cedar, cypress and juniper species.

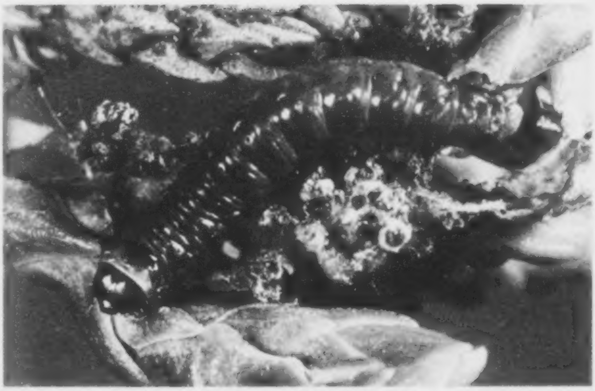
Similar species: No similar species occur on cedar, cypress or juniper in British Columbia. Mining damage caused by early instar larvae is superficially similar to that of cypress tip moth. The larva of this species, however, is green (p. 42).



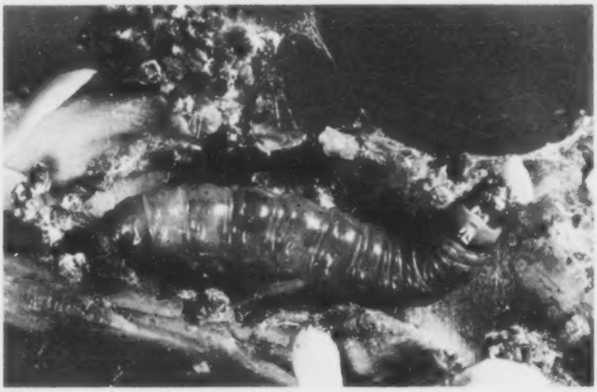
Feeding shelter on western redcedar



Dorsal view of early instar larva on mined eastern white-cedar



Dorsal view of mature larva on western redcedar



Dorsal view of mature larva on western redcedar

Epinotia tsugana Freeman
Hemlock needleminer

Hosts: Principal host is western hemlock; during outbreaks, it may also mine amabilis fir needles.

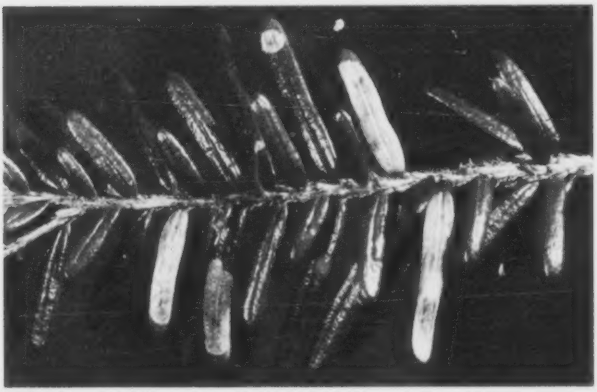
Distribution: North and west Vancouver Island.

Description: Mature larva up to 7 mm long. Head, black. Body, creamy brown; dorsum of each abdominal segment, marked with 2 pairs of light grey spots (pinacula).

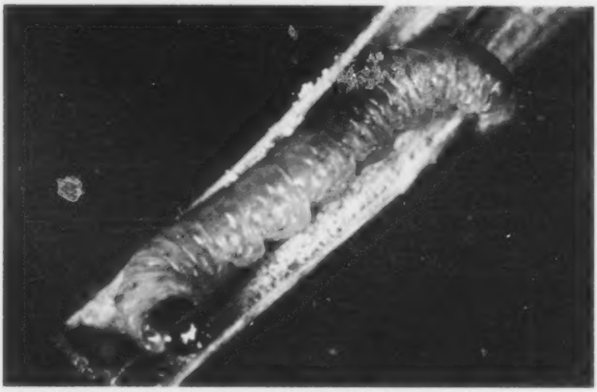
Bionomics: The larva overwinters in a mined needle, and actively feeds throughout much of the winter. Each larva mines 5 to 6 needles before completing its development in late April or early May. Pupation occurs in a small, whitish bark- or moss-encrusted cocoon on the underside of small twigs. Adults emerge from June to July, mate and lay tiny, pearly white eggs singly on the upper surface of needles from mid-June until mid-August. The larvae hatch in August, then mine into needles, covering the entrance holes with silk.

Damage: The hemlock needleminer occasionally causes serious defoliation. Outbreaks were recorded on northern Vancouver Island in the Ida–Reid Lake area near Beaver Cove in 1963 and in the Quatsino Sound area where more than 40 000 hectares were defoliated between 1965 to 1966. These short-lived outbreaks did not cause tree mortality.

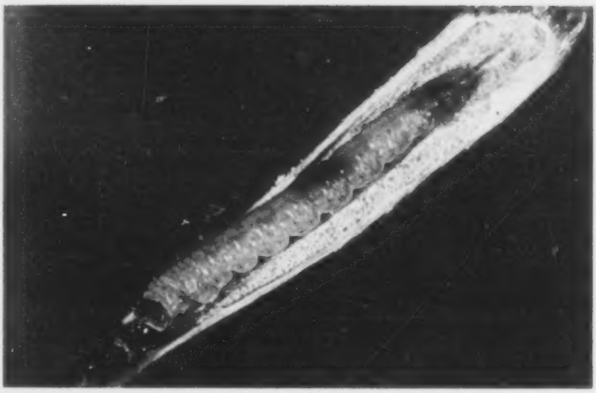
Similar species: No similar species occur on coniferous hosts in British Columbia.



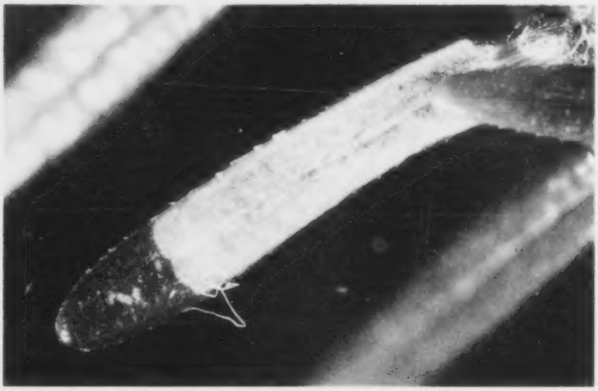
Typical feeding damage on western hemlock



Lateral view of mature larva in mined western hemlock needle



Dorso-lateral view of mature larva in mined western hemlock needle



Mined western hemlock needle, with mature larva inside

Platynota idaeusalis (Walker)

Hosts: A generalist feeder, for which a broad range of coniferous, hardwood and herbaceous host species have been recorded. Principal coniferous host in British Columbia is lodgepole pine.

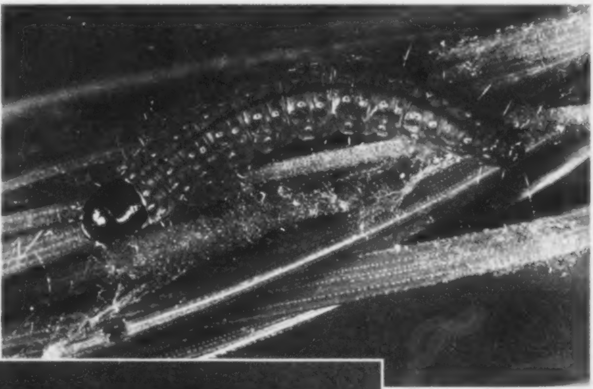
Distribution: Southern interior of British Columbia; east to Nova Scotia, and south to Florida and Texas.

Description: Mature larva up to 19 mm long. Head, brown. Prothoracic shield, black. Body, greenish grey; dorsum of each abdominal segment, marked with 2 pairs of light grey spots (pinacula). Grey middorsal stripe.

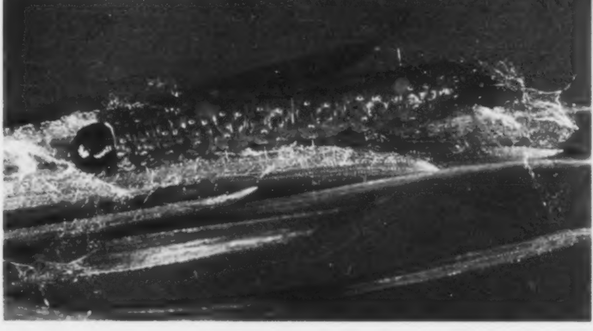
Bionomics: Overwintering stage is likely as a mid-instar larva. Larvae feed from May to mid-June, webbing needles together to form protected feeding shelters. Larvae pupate, usually within the feeding shelter, in June. Adults emerge 2 to 3 weeks later, and lay eggs in masses on host foliage. The eggs hatch within 2 weeks.

Damage: In British Columbia, *Platynota idaeusalis* is a relatively uncommon, solitary defoliator.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorsal view of mature larva on lodgepole pine



Dorso-lateral view of mature larva on lodgepole pine

Rhyacionia subcervinana (Walsingham)

Hosts: Ponderosa pine; also on Jeffrey pine in California.

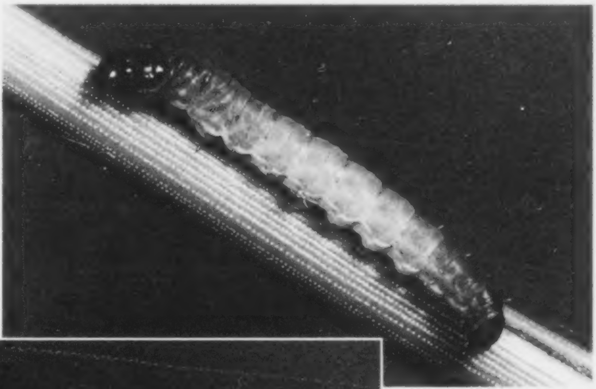
Distribution: Throughout the host range in the southern interior of British Columbia; south to California.

Description: Mature larva up to 8 mm long. Head and prothoracic shield, brown. Body, orange–brown shading to reddish brown at both the anterior and posterior ends. Anal plate, dark brown.

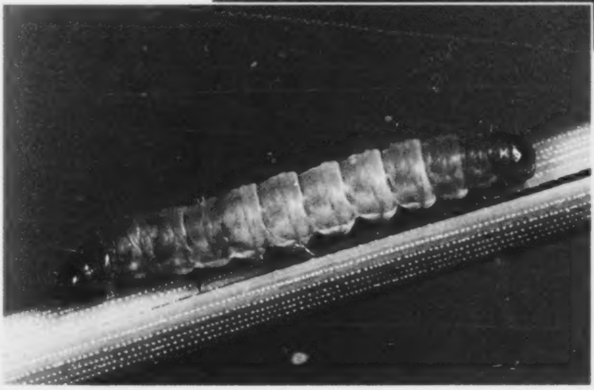
Bionomics: This species overwinters in a bud as an early instar larva. In the spring, the larva feeds within the sheaths of new needles, killing several needles. Pupation occurs, in late June, within sheaths of needle bundles. Adults emerge in July, and lay eggs singly on terminal buds. The eggs hatch soon after, and the larvae bore into buds.

Damage: *Rhyacionia subcervinana* is a relatively uncommon, solitary defoliator.

Similar species: No similar species occur on coniferous hosts in British Columbia.



Lateral view of mature larva on ponderosa pine



Dorso-lateral view of mature larva on ponderosa pine

Syndemis afflictana (Walker)

Hosts: Principal host in British Columbia is Douglas-fir; other coniferous hosts include subalpine fir and balsam fir. Reported from Monterey pine and coast redwood in California. Numerous hardwood and shrub hosts have also been recorded.

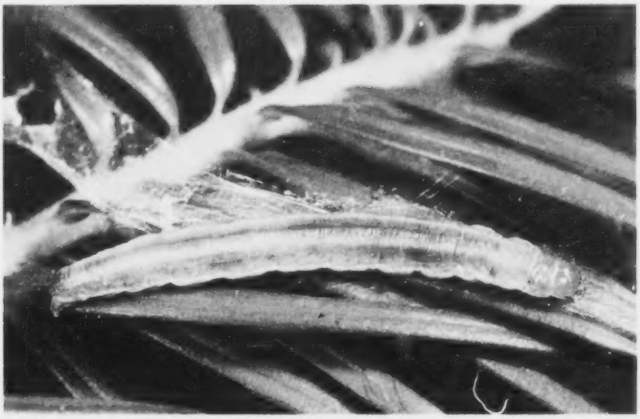
Distribution: Generally distributed throughout British Columbia south of 55° latitude; east to Nova Scotia, and south to Florida and California.

Description: Mature larva up to 20 mm long. Head, unmarked green. Body, yellowish green; yellow subdorsal stripe and prominent cream-colored spiracular stripe.

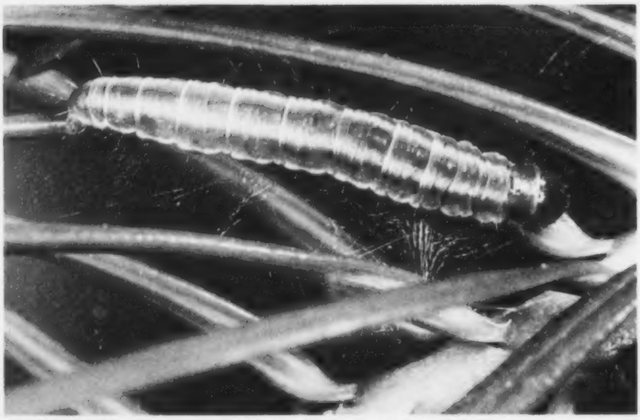
Bionomics: This species overwinters as a penultimate-instar or mature larva. Larvae feed from May to early June, pupation occurs in early June, and adults fly in mid- to late June. Larvae emerge soon after and feed until the onset of cold weather.

Damage: *Syndemis afflictana* is a common, innocuous, solitary defoliator.

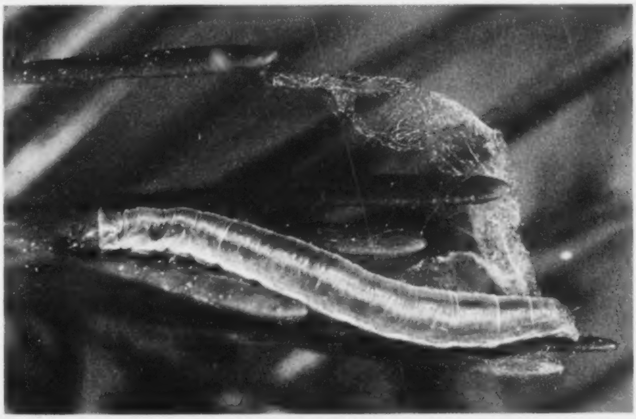
Similar species: No similar species occur on coniferous hosts in British Columbia.



Dorso-lateral view of mature larva on Douglas-fir



Dorso-lateral view of penultimate-instar larva on Douglas-fir



Dorso-lateral view of mature larva on Douglas-fir

Taniva albolineana (Kearfott)
Spruce needleminer

Hosts: White spruce, Engelmann spruce, Colorado spruce and Norway spruce.

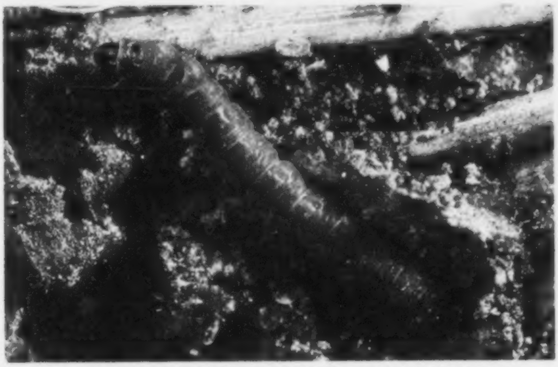
Distribution: South and central interior of British Columbia; east to Nova Scotia, and south to Maryland and California.

Description: Mature larva up to 8 mm long. Head and prothoracic shield, dark brown. Body, unmarked bright green. Mid-instar larvae are dull yellowish green or, rarely, yellowish brown.

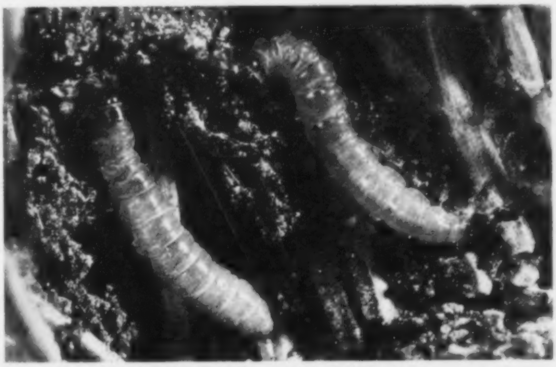
Bionomics: This species overwinters as a mid-instar larva in a communal nest formed from silk, dead mined needles and frass. In April, the larvae resume feeding, mining needles adjacent to the nest. The larvae mature by mid-May and pupate in silk-lined cocoons within the nest. Adults emerge about 2 weeks later. Females deposit groups of up to 12 pale green eggs, shingle fashion, on the lower surfaces of needles. The eggs hatch soon after, and the newly emerged larvae mine needles that are at least 1 year old. The larva cuts a hole near the base of a needle, then mines the interior. Sometimes, several larvae mine a single needle. When the interior of the needle has been consumed, the larva often cuts off the needle, which remains attached with silk strands. Feeding continues in this way until the first heavy frost, when each larva enters a hollowed needle and spins a web over the opening, which protects it from winter weather.

Damage: Individual trees are made unsightly by the silken webs containing dead needles and frass. Feeding nests can persist for a year and may cover much of the older growth on a tree, which creates an unhealthy appearance. Spruce needleminer may cause significant damage on spruce planted in urban settings, Christmas tree plantations and seed orchards.

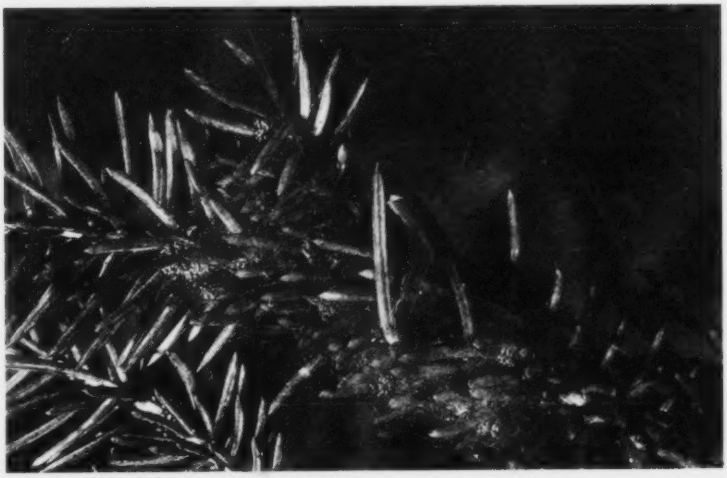
Similar species: No similar species occur on spruce in British Columbia.



Penultimate-instar larva in feeding shelter on Colorado spruce



Mature larvae in feeding shelter on Colorado spruce



Typical feeding damage on Colorado spruce

Zeiraphera canadensis Mutuura & Freeman
Spruce bud moth

Hosts: Sitka spruce, Engelmann spruce and white spruce.

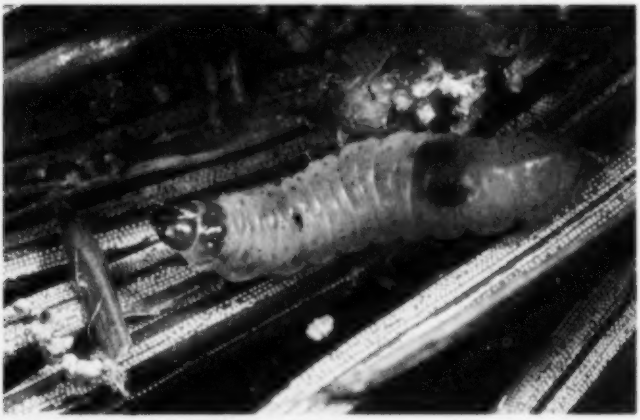
Distribution: Throughout British Columbia south of 55° latitude; east to Newfoundland, and south to California.

Description: Mature larva up to 12 mm long. Head, very small, tan. Body, cream with slight reddish tinge; dorsum of each abdominal segment, marked with 2 pairs of light grey spots (pinacula).

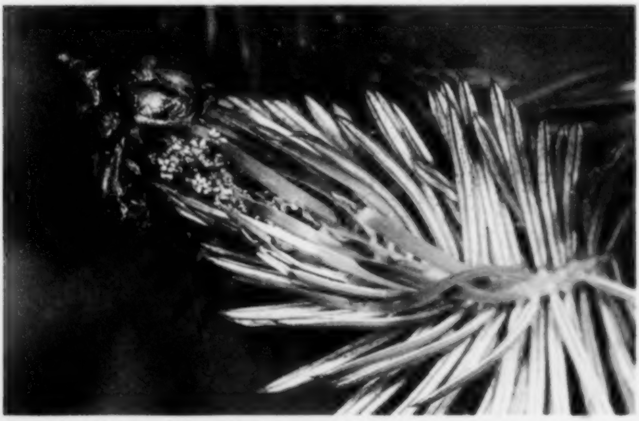
Bionomics: This species overwinters in the egg stage. Larvae emerge in late May during bud break. First-instar larvae attack newly swollen buds, initially feeding under the bud caps. As the shoots begin to elongate, the larvae attach the caps to the shoots with silk. Second-instar larvae tunnel through the needles at the shoots' distal ends. Third- and fourth-instar larvae feed more extensively on the surfaces of the stems and the proximal ends of needles. Once the larvae mature, they drop to the ground and pupate. The pupal stage lasts approximately 19 days. Adults emerge in July or August, mate, then lay eggs between bud scales.

Damage: The spruce bud moth is a common pest of spruce. It occasionally causes significant damage to expanding new terminal shoots, thereby altering the growth and form of infested trees.

Similar species: *Zeiraphera vancouverana* (p. 302), *Z. pacifica* (p. 298) and *Epinotia hopkinsana* (p. 276). *Zeiraphera canadensis* differs from *E. hopkinsana* in that the pinacula are faint rather than well defined. If larvae are collected on Sitka spruce and appear to be *Z. canadensis*, *Z. vancouverana* or *Z. pacifica*, they should be reared to the adult stage to confirm identification.



Dorsal view of mature larva on Sitka spruce



Feeding damage on Sitka spruce

Zeiraphera hesperiana Mutuura & Freeman

Host: Douglas-fir.

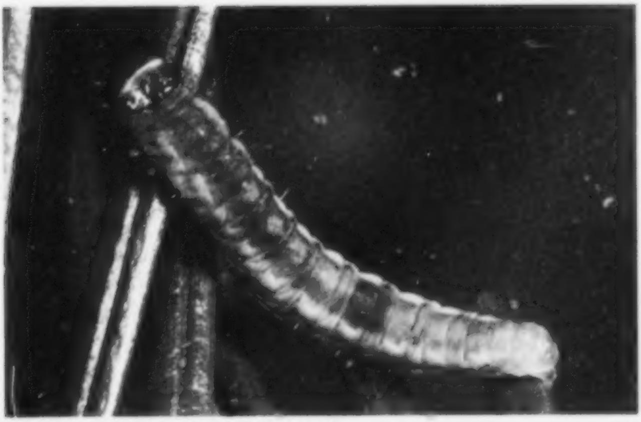
Distribution: Throughout the host range in British Columbia; south to California and New Mexico.

Description: Mature larva up to 15 mm long. Head, golden to chestnut brown, with a short, black dash on the cheek. Prothoracic shield, golden brown with black posterior margin. Body, olive brown; creamy yellow subdorsal stripes.

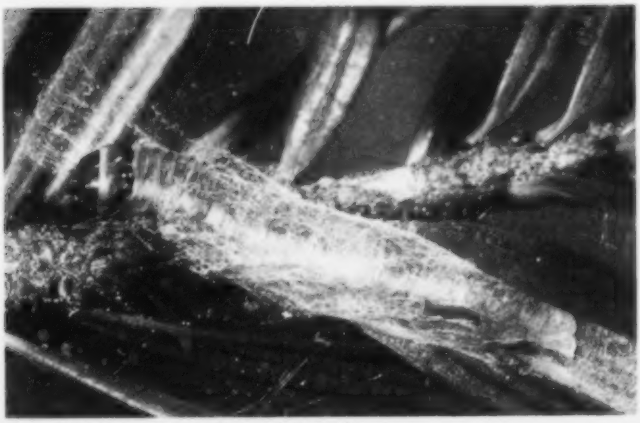
Bionomics: This species overwinters in the egg stage. The eggs are initially creamy yellow, and gradually turn orange within a week. Larvae emerge in mid-May during bud break. Larvae are present late May to early July. Once the larvae mature, they drop to the ground and pupate. The pupal stage lasts up to 3 weeks. Adults are in flight from July to August.

Damage: *Zeiraphera hesperiana* is a common, innocuous, solitary defoliator.

Similar species: No similar species occur on Douglas-fir in British Columbia.



Dorsal view of mature larva on Douglas-fir



Mature larva in silken shelter on Douglas-fir

Zeiraphera improbana (Walker)
Larch bud moth

Hosts: Western larch, tamarack and subalpine larch.

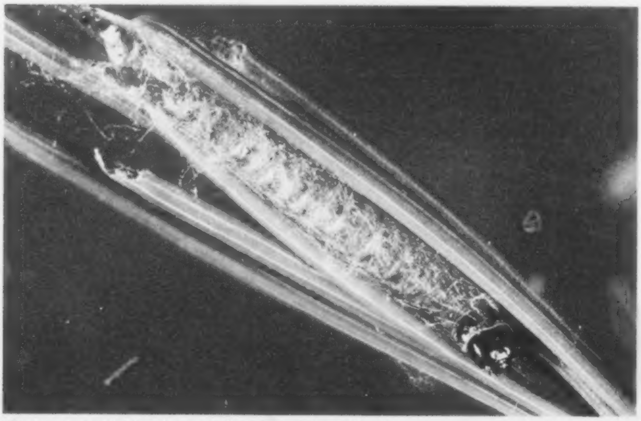
Distribution: Throughout the host range in the interior of British Columbia; east to Newfoundland, north to Alaska, Yukon and northern Quebec, and south to Virginia and Oregon.

Description: Mature larva up to 10 mm long. Head, chestnut brown. Prothoracic shield, black. Body, grey; dorsum of each abdominal segment, marked with 2 pairs of dark grey spots (pinacula). Anal plate, rusty orange.

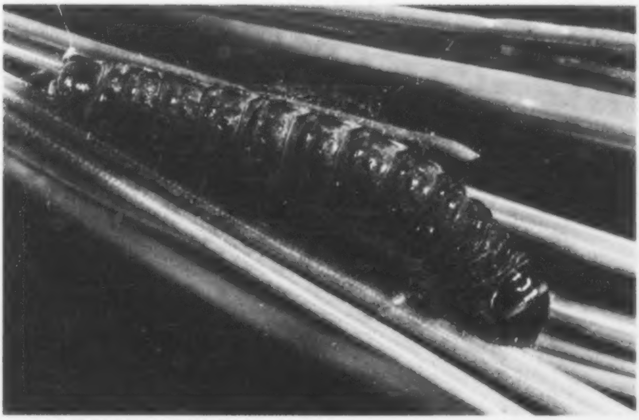
Bionomics: This species overwinters in the egg stage. Larvae emerge during bud break in mid-May, and feed singly in needle clusters. By mid-July, the larvae are mature and drop to the ground to pupate, making cocoons out of moss and dead larch needles. Adults are in flight from late July to early August. Females lay up to 160 eggs over a period of 4 days. Eggs are laid singly under bark scales, on cones, and in the crotches of branches and twigs.

Damage: The larch bud moth periodically causes severe defoliation to higher-elevation western larch stands in the southern interior of British Columbia. Outbreaks were recorded throughout parts of the Nelson and east Kamloops forest regions from 1965 to 1966, in Silver Star Provincial Park, east Arrow Lake, Edgewood and Nakusp from 1973 to 1974, near Granby in 1977, and in the Granby and Kettle Rivers, Grand Forks, Rossland, Invermere and Kimberley areas from 1983 to 1985.

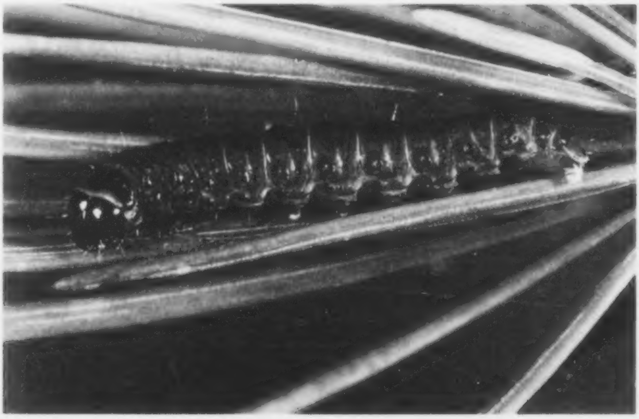
Similar species: No similar species occur on larch in British Columbia.



Mature larva in feeding shelter on western larch



Dorsal view of mature larva on western larch



Lateral view of mature larva on western larch

Zeiraphera pacifica Freeman

Host: Sitka spruce.

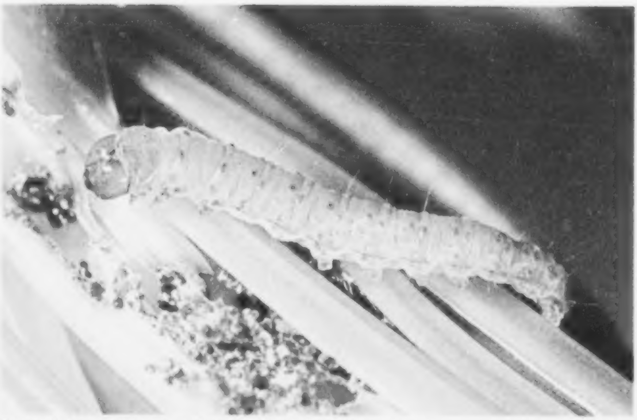
Distribution: North coastal British Columbia including the Queen Charlotte Islands.

Description: Mature larva up to 9 mm long. Head, very small, tan. Body, yellowish cream; dorsum of each abdominal segment, marked with 2 pairs of light grey spots (pinacula).

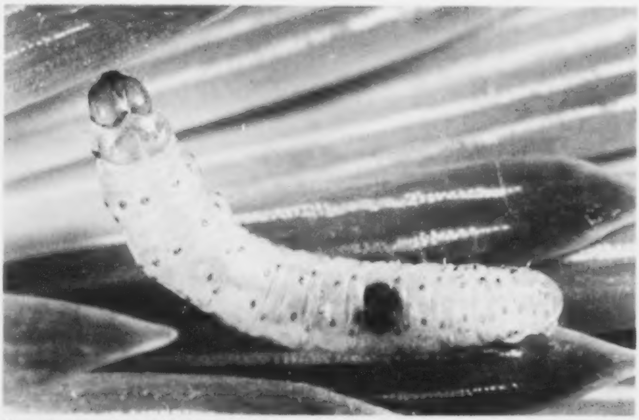
Bionomics: This species overwinters in the egg stage. Larvae emerge in May, during bud break. First-instar larvae initially feed under the bud caps. As the shoots begin to elongate, the larvae attach the caps to the shoots with silk. Second-instar larvae tunnel through the needles at the shoots' distal ends. Third- and fourth-instar larvae feed more extensively on the surfaces of the stems and the proximal ends of needles. Once the larvae mature, they drop to the ground and pupate. Adults emerge in July to August and, after mating, lay eggs tucked between bud scales.

Damage: *Zeiraphera pacifica* occasionally causes significant damage to expanding new terminal shoots, thereby altering the growth and form of infested trees.

Similar species: *Zeiraphera vancouverana* (p. 302), *Z. canadensis* (p. 292) and *Epinotia hopkinsana* (p. 276). *Z. pacifica* differs from *E. hopkinsana* in that the pinacula are faint rather than well defined. If larvae are collected on Sitka spruce and appear to be *Z. canadensis*, *Z. vancouverana* or *Z. pacifica*, they should be reared to the adult stage to confirm identification.



Dorso-lateral view of mid-instar larva on Sitka spruce



Dorsal view of penultimate-instar larva on Sitka spruce

Zeiraphera unfortunana Powell

Hosts: Principal hosts are Engelmann spruce, Sitka spruce and white spruce; other hosts include subalpine fir and balsam fir.

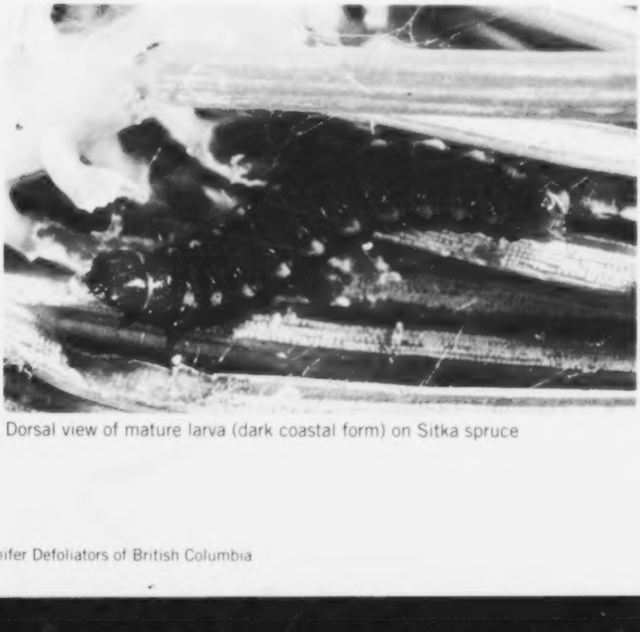
Distribution: Throughout the host range, on the coast and in the interior of British Columbia; east to Nova Scotia, and north to the Yukon.

Description: Mature larva up to 15 mm long. Head, chestnut brown to dark brown. Prothoracic shield, dark brown to black. Body, light to dark purplish brown; subdorsal stripes, creamy yellow. Dorsum of each abdominal segment, marked with 2 pairs of dark spots (pinacula).

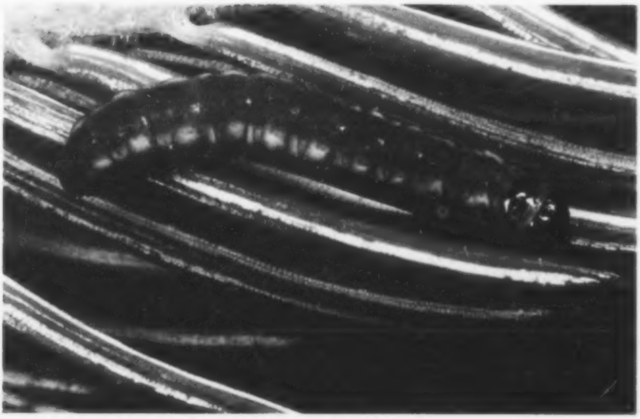
Bionomics: This species overwinters in the egg stage. Larvae begin to emerge in late May, during bud break, and are present from June to early July. Once the larvae mature, they drop to the ground, and pupate. The pupal stage lasts up to 3 weeks. Adults emerge from July to early August.

Damage: *Zeiraphera unfortunana* is a common pest of spruce, sometimes causing visible damage to expanding new terminal shoots.

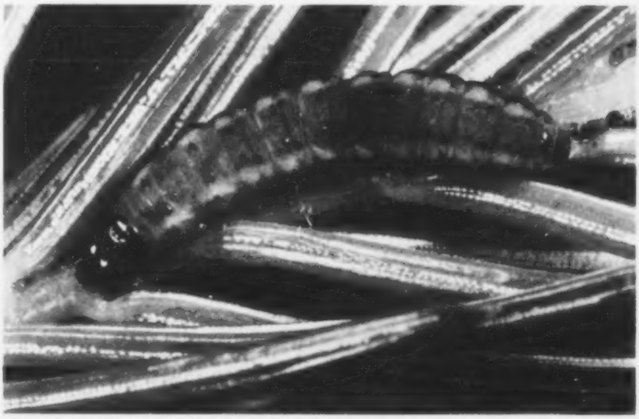
Similar species: No similar species occur on spruce in British Columbia.



Dorsal view of mature larva (dark coastal form) on Sitka spruce



Dorsal view of mature larva on Engelmann spruce



Dorsal view of mature larva (light-colored form) on Engelmann spruce

Zeiraphera vancouverana (McDunnough)

Host: Sitka spruce.

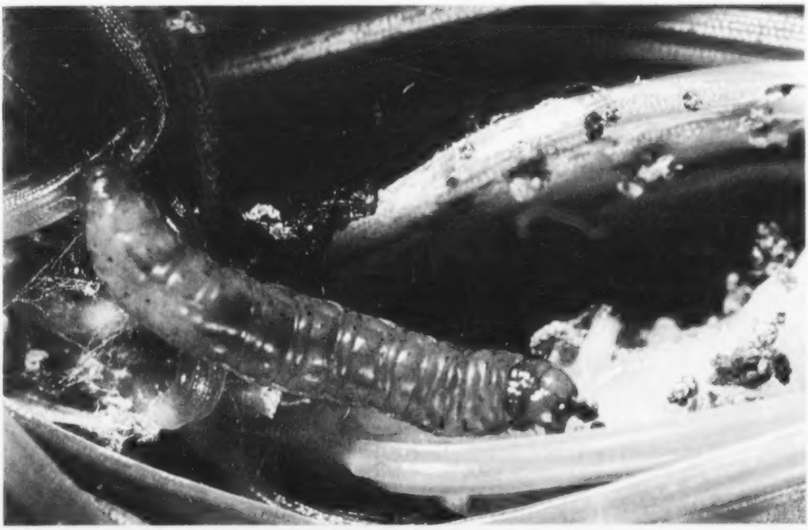
Distribution: West coast of Vancouver Island; south to Oregon.

Description: Mature larva up to 9 mm long. Head, very small, tan. Body, yellowish brown; dorsum of each abdominal segment, marked with 2 pairs of grey spots (pinacula).

Bionomics: This species overwinters in the egg stage. Larvae emerge in May, during bud break. First-instar larvae initially feed under the bud caps. As the shoots begin to elongate, the larvae attach the caps to the shoots with silk. Second-instar larvae tunnel through the needles at the shoots' distal ends. Third- and fourth-instar larvae feed more extensively on the surfaces of stems and the proximal ends of needles. Once the larvae mature, they drop to the ground and pupate. Adults emerge in July to August and, after mating, lay eggs tucked between bud scales.

Damage: *Zeiraphera vancouverana* is a common pest of Sitka spruce. It occasionally causes significant damage to expanding new terminal shoots, thereby altering the growth and form of infested trees.

Similar species: *Zeiraphera pacifica* (p. 298), *Z. canadensis* (p. 292) *and Epinotia hopkinsana* (p. 276). *Zeiraphera vancouverana* differs from *E. hopkinsana* in that the pinacula are faint rather than well defined. If larvae are collected on Sitka spruce and appear to be *Z. canadensis*, *Z. vancouverana* or *Z. pacifica*, they should be reared to the adult stage to confirm identification.



Dorsal view of mid-instar larva on Sitka spruce

Ocnerostoma piniariella Zeller

Hosts: Western white pine and white pine.

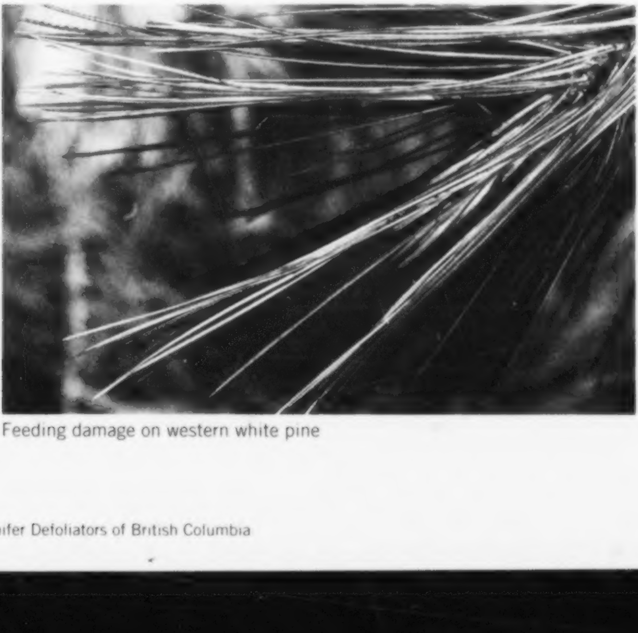
Distribution: Introduced European species. South coastal British Columbia; also occurs in Ontario, Quebec. Europe.

Description: Mature larva up to 7 mm long. Head, yellowish brown with a prominent black V-shaped marking that outlines the frontal triangle. Prothoracic shield, pale grey. Body, unmarked, yellowish brown above, fading to creamy yellow along the lateral flange.

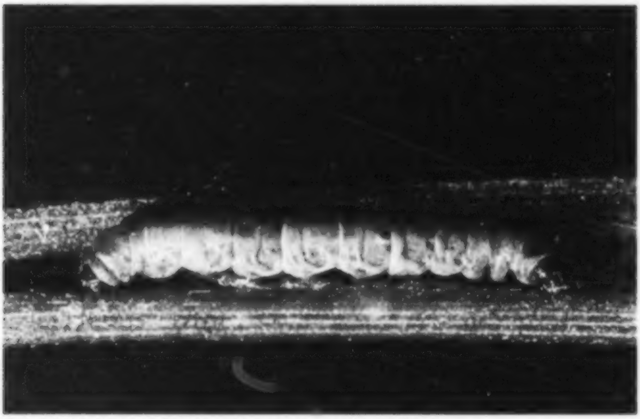
Bionomics: This species overwinters as a second-instar larva within a mined needle. The larva becomes active in the spring, mining several needles by late April. It then vacates the mine and ties several needles together to form a sheath. Pupation occurs within the silk-lined sheath in early May, and lasts for about 2 months. The adults are in flight from mid-July to September, and lay eggs singly along the inner sides of needles shortly after emerging. The eggs hatch in about 3 weeks. During hatch, the larva bores through the underside of the egg directly into the needle. The larva then mines down the needle, filling the cavity behind it with frass. Feeding then ceases for the winter.

Damage: *Ocnerostoma piniariella* is a solitary needleminer. Heavy populations can cause noticeable needle discoloration in spring. The needles damaged by the larvae in the spring drop in late summer.

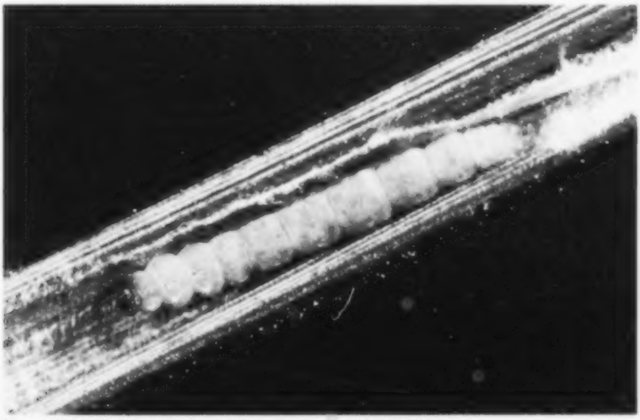
Similar species: No similar species occur on western white pine or white pine in British Columbia.



Feeding damage on western white pine



Dorso-lateral view of mature larva on western white pine



Dorso-lateral view of prepupal larva on western white pine

Zelleria haimbachi Busck
Pine needle sheathminer

Hosts: Principal host is lodgepole pine; other hosts include ponderosa pine and jack pine.

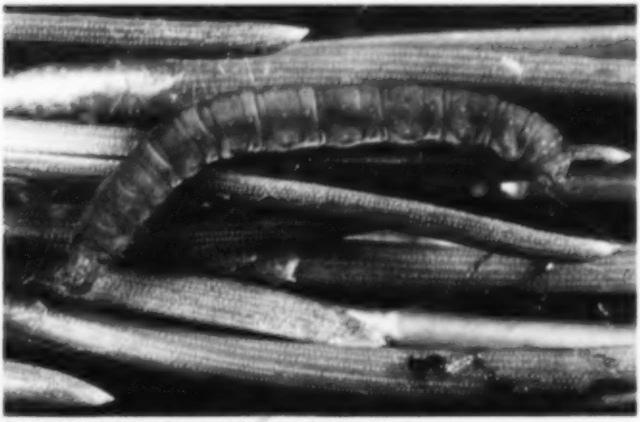
Distribution: Southern British Columbia; east to Quebec, and south to New York and California.

Description: Mature larva up to 14 mm long. Head, small, tan. Body, slender, rusty brown; greenish grey dorsum, yellowish cream lateral flange. Rusty brown areas replaced by green in prepupal larvae.

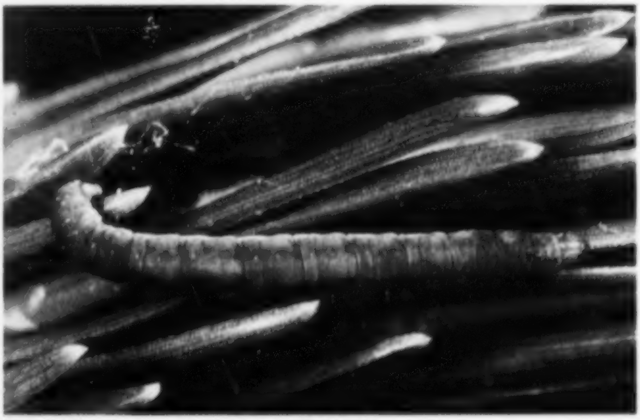
Bionomics: This species overwinters as a first-instar larva in a mined needle. In the spring, the larva becomes active, and widens and lengthens the mine to about 5 mm. The larva then bores to the surface, leaves the needle and migrates to the new growth flush, where it begins feeding within the sheaths of the young needles. Typically, each larva will feed on 6 to 10 needle fascicles before pupating. Pupation occurs in late June, in an elongated white cocoon spun between the bases of the mined needle sheaths, and lasts about 10 days. Adults emerge in July. Females lay eggs singly from early July to mid-August, mostly on current-year foliage. The larvae emerge in about 10 days, boring directly through the bottom of the eggs and into needles.

Damage: The pine needle sheathminer can cause near-total defoliation during outbreaks. Infestations were recorded near Penticton in 1951, at Spences Bridge in 1958, near Louis Creek and Scotch Creek in 1962, in Clearwater–Vavenby from 1979 to 1980, and in Clearwater–Shuswap from 1985 to 1992. Mortality has not been observed, but tree growth may be reduced.

Similar species: No similar species occur on pines in British Columbia.



Dorso-lateral view of mature larva on lodgepole pine



Dorsal view of mature larva on lodgepole pine

Neodiprion abietis complex (Harris)

Balsam fir sawfly

Hosts: Amabilis fir, subalpine fir, Engelmann spruce, white spruce, Sitka spruce and Douglas-fir.

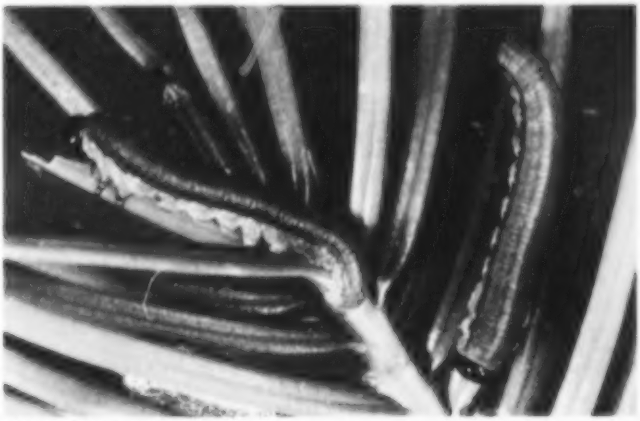
Distribution: Throughout British Columbia; east to Newfoundland.

Description: Mature larva up to 18 mm long. Head, unmarked brown (teneral) or black. Body, greyish green; light greyish green middorsal stripe; broad greyish green addorsal stripe; light greyish green supraspiracular stripe; dark greyish green spiracular stripe; light green below the lateral midline. Prepupal larvae are similarly marked, but are brown. Eight pairs of abdominal prolegs.

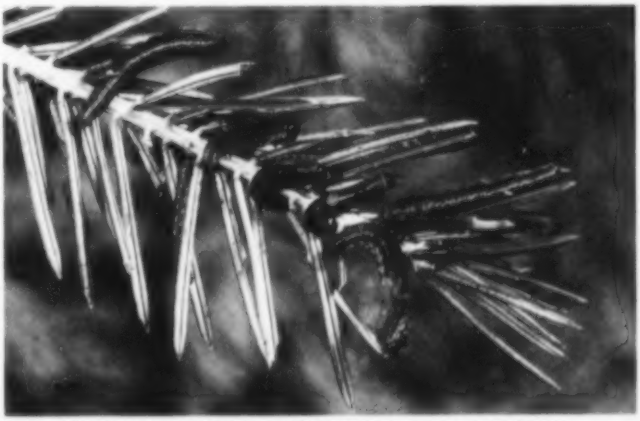
Bionomics: This species overwinters in the egg stage. Eggs hatch in June, and larvae are present from June to early August. Larvae feed in colonies, preferring 1- or 2-year-old foliage. Mature larvae spin cocoons on foliage from late July to early August; adults emerge in August to September. Females lay about 40 eggs in niches cut into the edges of current-year needles.

Damage: The balsam fir sawfly is a common and frequently destructive colonial defoliator. Outbreaks occur occasionally, and may cause growth loss or limited tree mortality.

Similar species: Other *Neodiprion* species appear similar, but feed on different hosts.



Mature larvae on Douglas-fir



Colony of mature larvae feeding on Sitka spruce, various color forms

Neodiprion mundus Rohwer

Host: Ponderosa pine.

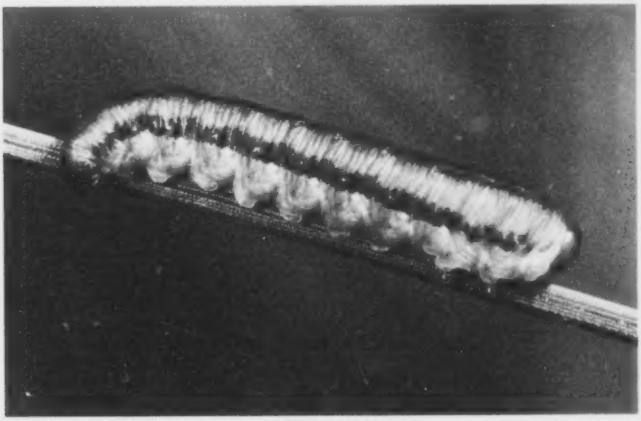
Distribution: Throughout the host range in the southern interior of British Columbia; south to California.

Description: Mature larva up to 24 mm long. Head, unmarked brown (teneral) or black. Body, greyish green; light grey middorsal stripe; broad greenish grey addorsal stripes; light grey supraspiracular stripe; dark greenish grey spiracular stripe; light grey below lateral midline. Prepupal larvae are similarly marked, but are brown. Eight pairs of abdominal prolegs.

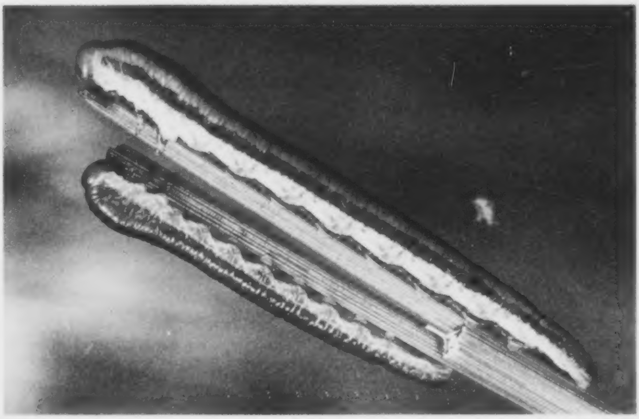
Bionomics: This species overwinters in the egg stage. Larvae are present from mid-May to June. Mature larvae spin cocoons in July, and adults emerge from late July to August. Eggs are laid in niches cut into the edges of needles.

Damage: *Neodiprion mundus* is a common and rarely destructive colonial defoliator. Localized outbreaks were recorded in the Deadman River area from 1946 to 1951, and along the north arm of Okanagan Lake in 1964.

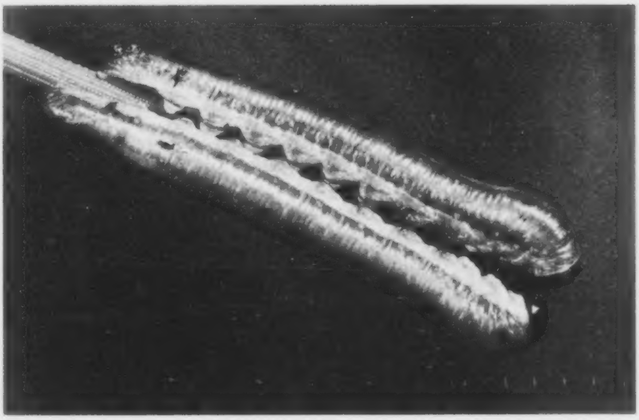
Similar species: Other *Neodiprion* species appear similar, but are much smaller and feed on different hosts.



Lateral view of prepupal larva on ponderosa pine



Penultimate-instar larvae feeding on ponderosa pine



Mature larvae feeding on ponderosa pine

Neodiprion nanulus contortae Ross

Host: Lodgepole pine.

Distribution: Throughout the host range in British Columbia; east to mountainous western Alberta, and south to Oregon and Montana.

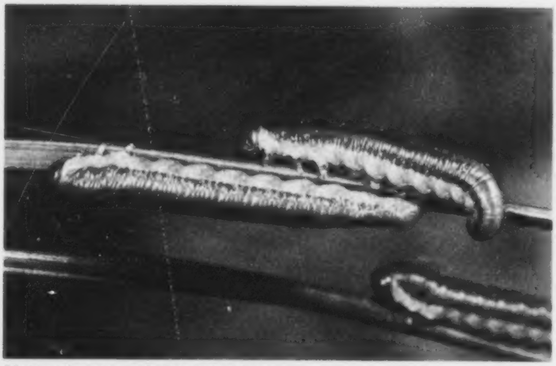
Description: Mature larva up to 21 mm long. Head, unmarked brown (teneral) or black. Body, green to greyish green; light green middorsal stripe; broad green subdorsal stripe; light green supraspiracular stripe; dark greyish green spiracular stripe; light yellowish green below the lateral midline. Prepupal larvae are similarly marked, but are brown to yellowish brown. Eight pairs of abdominal prolegs.

Bionomics: This species overwinters in the egg stage. Larvae feed on 1-year-old or older foliage from late May to early July. They feed in groups or colonies, usually devouring all the needles (except the current growth) on a branch before migrating to another branch. They complete 4 or 5 instars in 4 to 6 weeks. The mature larvae drop from the tree and spin cocoons in the duff. A variable percentage of larvae may diapause in the cocoons for 2 or more years. Adults emerge from September to October, and lay eggs in slits along the margins of needles.

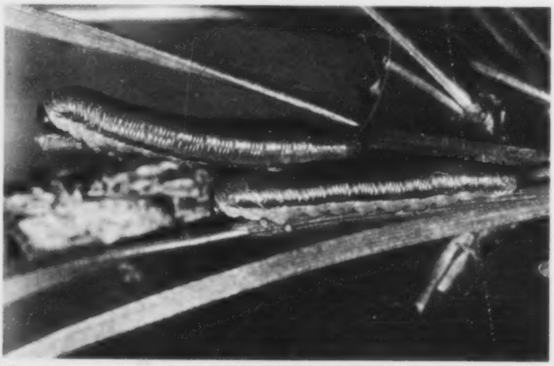
Damage: *Neodiprion nanulus contortae* is a common colonial defoliator. Populations occasionally reach epidemic levels, causing significant defoliation. A major outbreak covering more than 14 000 ha was recorded along the North Thompson River north of Vavenby from 1976 to 1978. Smaller-scale outbreaks occurred near Chilliwack Lake in 1960, near Campbell River in 1963, on several outer islands south of Prince Rupert from 1975 to 1976, near Nadu Creek on the Queen Charlotte Islands from 1983 to 1984, and on the Winchelsea Islands, near Nanoose Bay, in 2001.

During outbreaks, some trees that have been defoliated for 2 or more years may die or suffer growth loss.

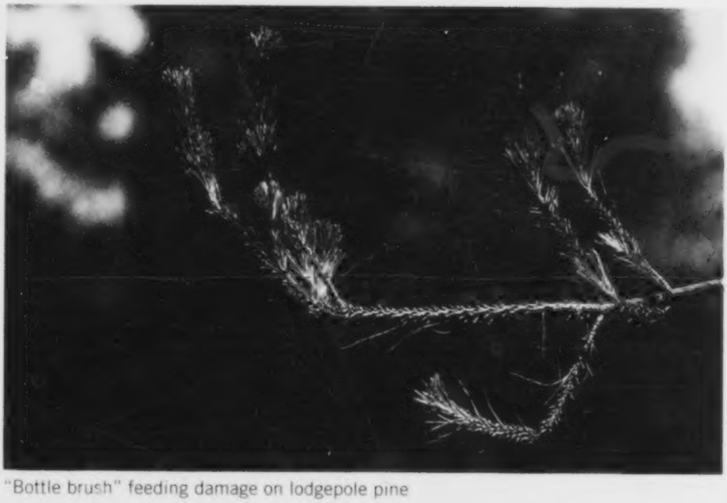
Similar species: Other *Neodiprion* species appear similar, but feed on different hosts.



Mature larvae on lodgepole pine



Mature larvae feeding on lodgepole pine



"Bottle brush" feeding damage on lodgepole pine

Neodiprion nanulus nanulus Schedl
Red pine sawfly

Hosts: Jack pine; also occurs on red pine in eastern North America.

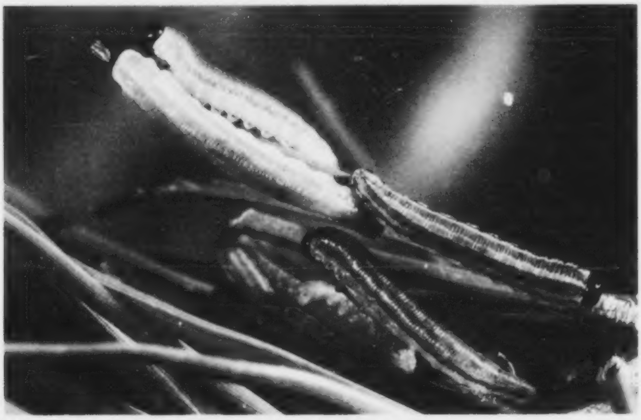
Distribution: This species occurs in jack pine stands along the Fort Nelson River in northeast British Columbia; east to Nova Scotia, and south to Pennsylvania.

Description: Mature larva up to 21 mm long. Head, unmarked brown (teneral) or black. Body, green to yellowish green; yellowish green middorsal stripe; broad green subdorsal stripe; yellowish green supraspiracular stripe; dark greyish green spiracular stripe; light yellowish green below the lateral midline. Prepupal larvae are similarly marked, but are brown to yellowish brown. Eight pairs of abdominal prolegs.

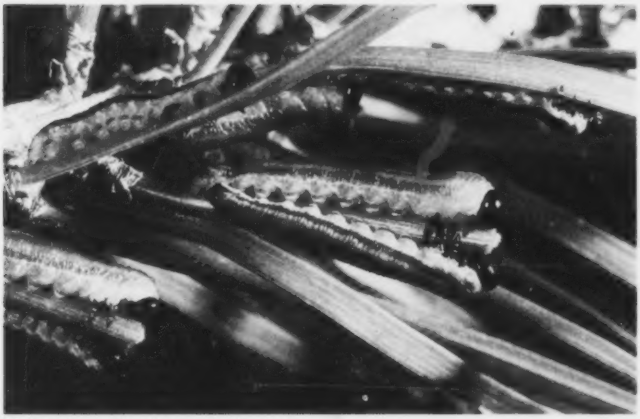
Bionomics: This species overwinters in the egg stage. Larvae feed on 1-year-old or older foliage from late May to mid-July. They feed in groups or colonies, usually devouring all the needles (except the current growth) on a branch before migrating to another. They complete 4 or 5 instars in 4 to 6 weeks. Mature larvae spin cocoons in the duff. A variable percentage of larvae may diapause in the cocoons for 2 or more years. Adults emerge from September to October, and lay eggs in slits along the margins of needles.

Damage: *Neodiprion nanulus nanulus* feeds mostly on old foliage, but will eat new needles after the old foliage has been consumed. Outbreaks have not been recorded in British Columbia.

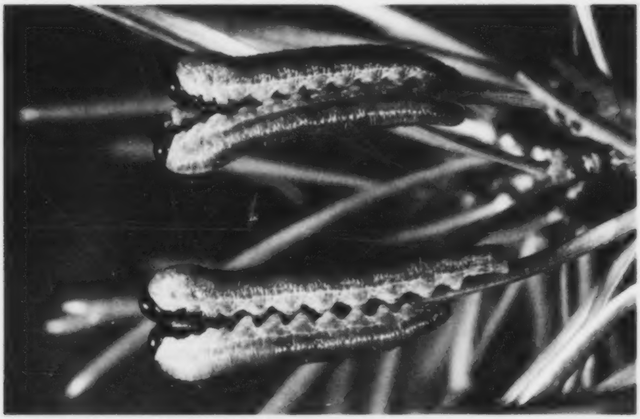
Similar species: Other *Neodiprion* species appear similar, but feed on different hosts.



Mature and prepupal larvae feeding on jack pine



Mature larvae feeding on jack pine



Mature larvae feeding on jack pine

Neodiprion sertifer (Geoffroy)
European pine sawfly

Hosts: Austrian pine, Scots pine and mugho pine.

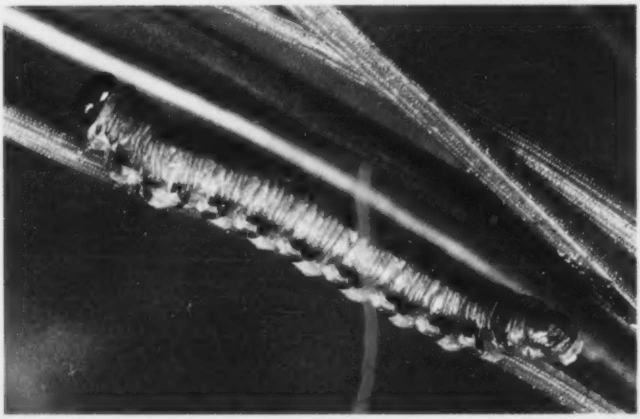
Distribution: Introduced Eurasian species. South coastal British Columbia; also occurs in southern Ontario, and from Iowa to the New England states. Old World distribution includes most of Europe and Japan.

Description: Mature larva up to 25 mm long. Head, unmarked black. Body, greyish green; dark-bordered, light grey middorsal pinstripe; broad greenish grey addorsal stripe; light grey spiracular stripe, bordered by dark grey supraspiracular and subspiracular stripes. Each abdominal segment is marked with a pair of black-spotted annules. Prepupal larvae are brown to pinkish brown, with 2 middorsal black lines. Eight pairs of abdominal prolegs.

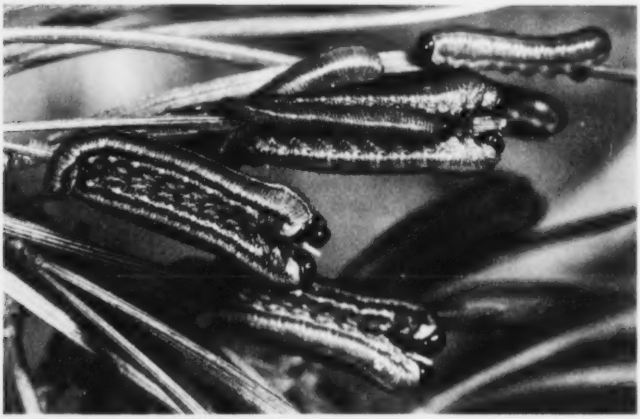
Bionomics: This species overwinters in the egg stage. The eggs hatch from April to early May, and larvae feed gregariously on old needles until early June. Mature larvae drop to the ground by mid-June and spin tough brown cocoons in the duff. Adults emerge from September to early October. Females lay about 80 eggs in niches cut into the edges of current-year needles.

Damage: In British Columbia, the European pine sawfly occasionally goes into outbreak on individual open-grown pines planted as ornamentals on urban properties. The old foliage is totally consumed on heavily infested trees, giving the tree a bottle-brush appearance.

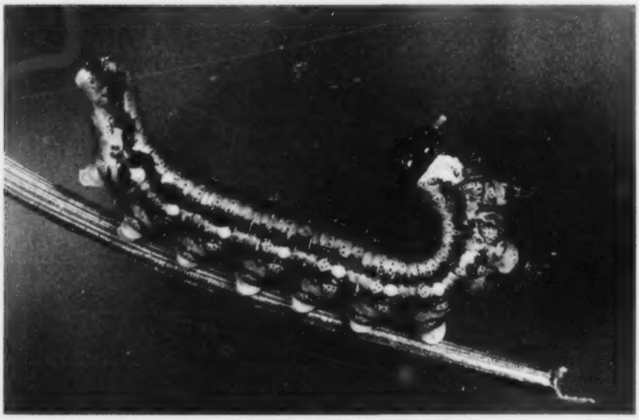
Similar species: Other *Neodiprion* species appear similar, but feed on different hosts.



Prepupal larva on Scots pine



Mature larvae feeding on Scots pine



Lateral view of mature larva in defensive pose on Scots pine

Neodiprion tsugae Middleton

Hemlock sawfly

Hosts: Principal host is western hemlock; other hosts include mountain hemlock and amabilis fir.

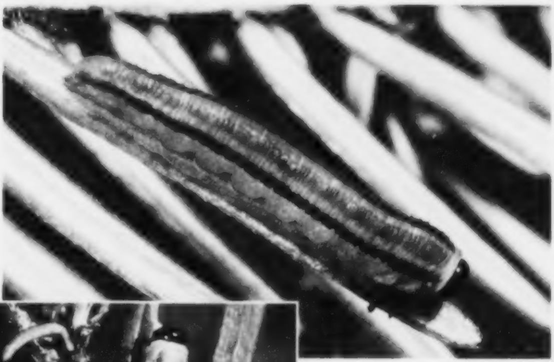
Distribution: Throughout the range of the principal host in British Columbia; south to California.

Description: Mature larva up to 18 mm long. Head, unmarked brown (teneral) or black. Body, green to yellowish green; yellowish green middorsal stripe; broad greyish green addorsal stripe; dark greyish green spiracular stripe; yellowish green supraspiracular stripe; light yellowish green below the lateral midline. Prepupal larvae are similarly marked, but are brown, pinkish brown, or yellowish brown. Eight pairs of abdominal prolegs.

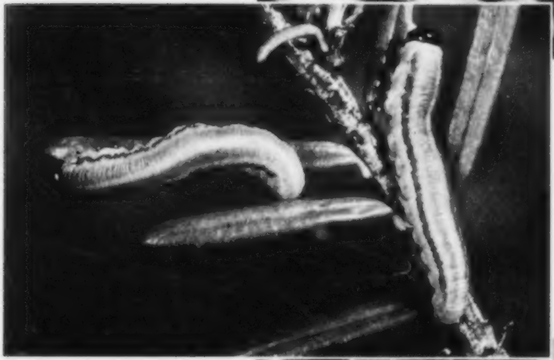
Bionomics: This species overwinters in the egg stage. Larvae feed gregariously on old needles from late June to early August. Mature larvae spin cocoons on foliage in late July or early August, and adults emerge September to early October. Females lay about 75 eggs in niches cut into the edges of current-year needles. A small proportion of the population overwinter as prepupal larvae in cocoons; some may diapause through a second winter.

Damage: The hemlock sawfly is a common and frequently destructive colonial defoliator. Major outbreaks have been recorded in the Bowron River to McBride section of the Upper Fraser River from 1975 to 1977, in the Kelsey Bay area from 1978 to 1981, along the Skeena and Kispiox Rivers from 1978 to 1979, and on the Queen Charlotte Islands from 1985 to 1988. Sawfly feeding damage is usually restricted to stripping older needles throughout the crown of the tree. Some tree mortality and top kill may occur in heavily defoliated stands. Hemlock sawfly populations sometimes peak in synchrony with those of the western blackheaded budworm, increasing defoliation.

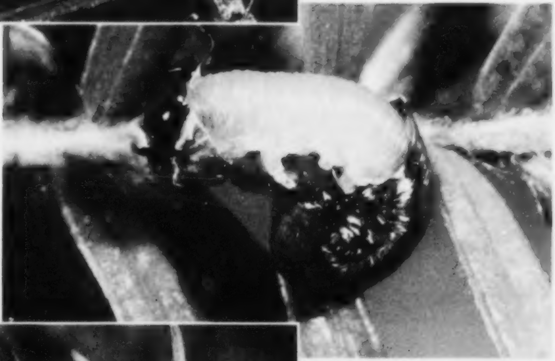
Similar species: Other *Neodiprion* species appear similar, but feed on different hosts.



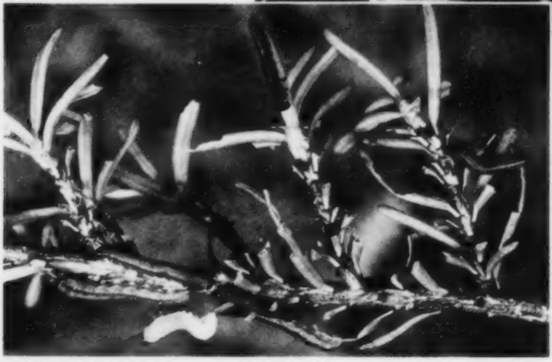
Dorso-lateral view of mature larva on western hemlock



Prepupal (left) and mature (right) larvae on western hemlock



Mature larva at ecdysis



Colony of larvae on mountain hemlock

Acantholyda atrata (Cresson)

Hosts: Grand fir, subalpine fir and western hemlock.

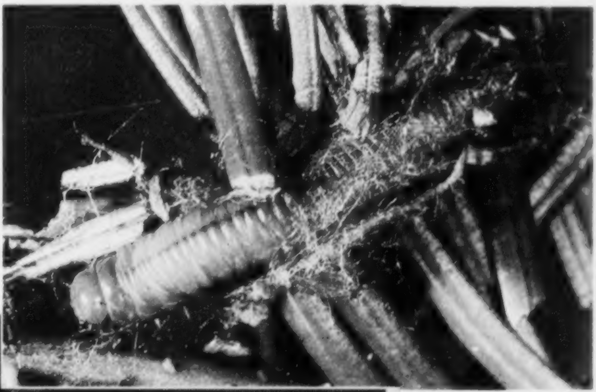
Distribution: South and central British Columbia; north to southeast Alaska, and south to California.

Description: Mature larva up to 18 mm long. Head, light tan, with a pair of 7-segmented antennae. Body, yellowish green; dark green middorsal and midventral stripes; prominent gold spiracles; greenish yellow subspiracular stripe. A pair of jointed appendages occurs at the posterior end.

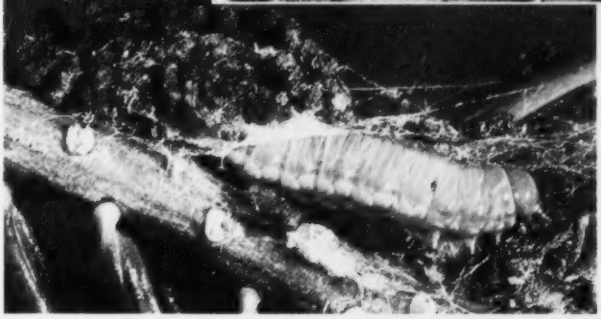
Bionomics: This species overwinters as a prepupal larva in earthen cells. Adults emerge in spring or early summer. Larvae construct silken webs and are active from June to July. Mature larvae drop to the soil in July and construct earthen cells.

Damage: *Acantholyda atrata* is an uncommon, solitary defoliator.

Similar species: Other *Acantholyda* species (p. 321–323) appear similar, but often have different host preferences. Where several species are known to occur on a specific host, adults should be reared from larvae to confirm identification.



Dorsal view of mature larva in feeding shelter on grand fir



Lateral view of mature larva in feeding shelter on grand fir

Acantholyda balanata (MacGillivray)

Hosts: Principal hosts are Sitka spruce and Engelmann spruce; other hosts include lodgepole pine, ponderosa pine, Douglas-fir, grand fir and western hemlock.

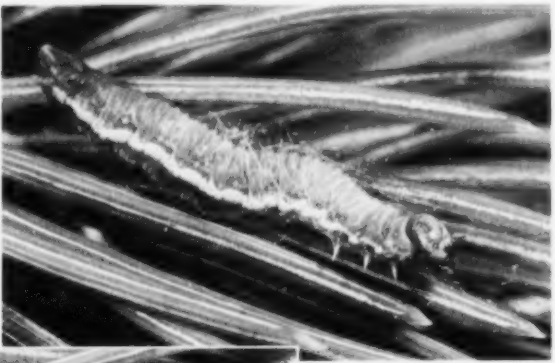
Distribution: South and central British Columbia; north to Alaska, and south to California.

Description: Mature larva up to 18 mm long. Head, light tan, with a pair of 7-segmented antennae and rows of brown spots in 2 patches over the crown. Body, yellowish green; dark green middorsal and midventral stripes; prominent gold spiracles; yellow subspiracular stripe. A pair of jointed appendages occurs at the posterior end.

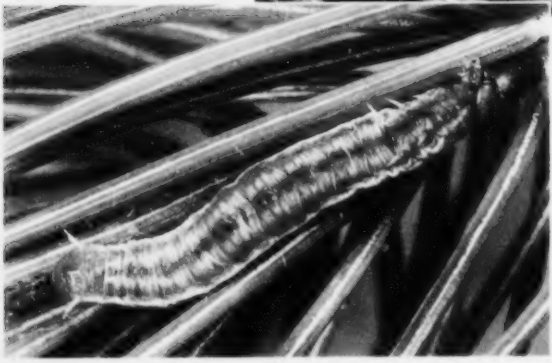
Bionomics: This species overwinters as a prepupal larva in earthen cells. Adults emerge in spring or early summer. Larvae construct silken webs and are active from June to July. Mature larvae drop to the soil in late July or August and construct earthen cells.

Damage: *Acantholyda balanata* is a common, innocuous, solitary defoliator.

Similar species: Other *Acantholyda* species (p. 320–323) appear similar, but often have different host preferences. Where several species are known to occur on a specific host, adults should be reared from larvae to confirm identification.



Lateral view of mature larva on Engelmann spruce



Ventral view of mature larva on Engelmann spruce

Acantholyda bucephala (Cresson)

Host: Douglas-fir.

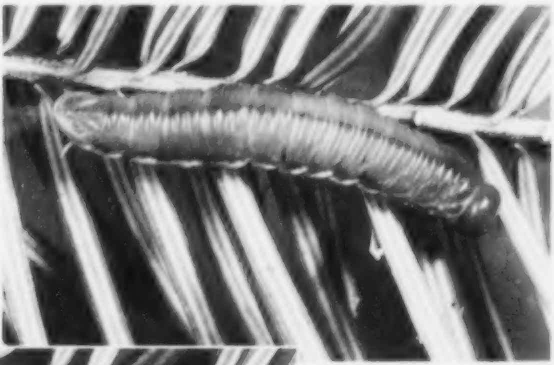
Distribution: South coastal British Columbia; south to California.

Description: Mature larva up to 18 mm long. Head, green, with a pair of 7-segmented antennae. Body, yellowish green; dark green middorsal stripe; prominent gold spiracles; yellow subspiracular stripe. A pair of jointed appendages occurs at the posterior end.

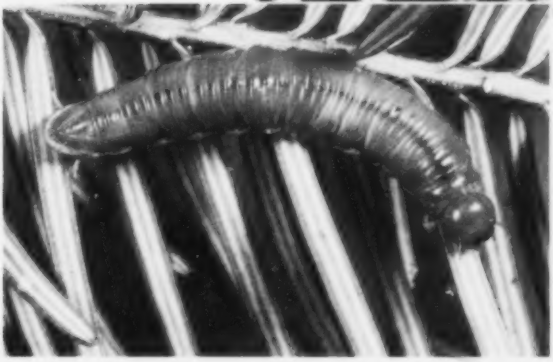
Bionomics: This species overwinters as a prepupal larva in earthen cells. Adults emerge in spring or early summer. Larvae construct silken webs and are active from June to September. Mature larvae drop to the soil in late September and construct earthen cells.

Damage: *Acantholyda bucephala* is an uncommon, solitary defoliator.

Similar species: Other *Acantholyda* species (p. 320–323) appear similar, but often have different host preferences. Where several species are known to occur on a specific host, adults should be reared from larvae to confirm identification.



Dorsal view of mature larva on Douglas-fir



Dorsal view of mature larva on Douglas-fir

Acantholyda verticalis (Cresson)

Hosts: Principal hosts are lodgepole pine and ponderosa pine; other hosts include western white pine and Monterey pine.

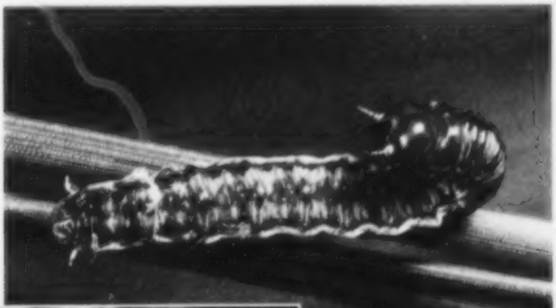
Distribution: Central and southern British Columbia; east to mountainous western Alberta, and south to California.

Description: Mature larva up to 18 mm long. Head, light tan, with a pair of 7-segmented antennae and rows of brown spots in 2 patches over the crown. Body, rusty brown; prominent purplish brown middorsal and midventral stripes; yellow subspiracular stripe. A pair of jointed appendages occurs at the posterior end.

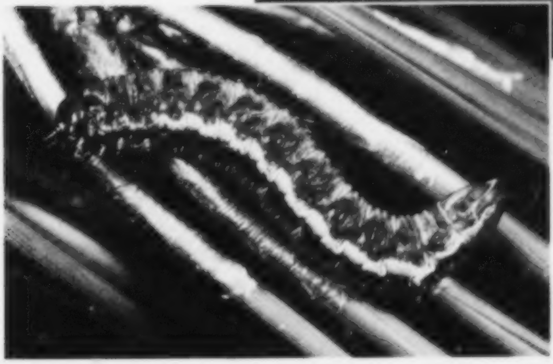
Bionomics: This species overwinters as a prepupal larva in earthen cells. Adults emerge in spring or early summer. Larvae construct silken webs and are active from June to July. Mature larvae drop to the soil in late July or August and construct earthen cells.

Damage: *Acantholyda verticalis* is an uncommon, solitary defoliator.

Similar species: Although a larva of *Acantholyda brunnicans* (Norton) was not collected during this study, it is likely to be similar to *Acantholyda verticalis*. Adults should be reared from larvae to confirm identification.



Ventral view of mature larva on ponderosa pine



Lateral view of mature larva on ponderosa pine

Cephalcia californica Middlekauff

Hosts: Principal hosts are ponderosa pine and lodgepole pine; also occurs on western white pine.

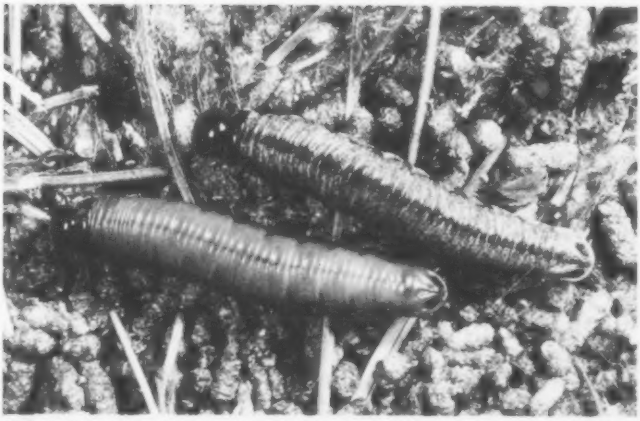
Distribution: South coast and southern interior of British Columbia; east to mountainous western Alberta, and south to California.

Description: Mature larva up to 25 mm long. Penultimate- and earlier-instar larvae, mottled yellowish brown; dark brown middorsal, midventral and spiracular stripes. Final-instar larva, green; faint dark green middorsal stripe; black dashes above the thoracic legs and on dorsum of the last abdominal segment.

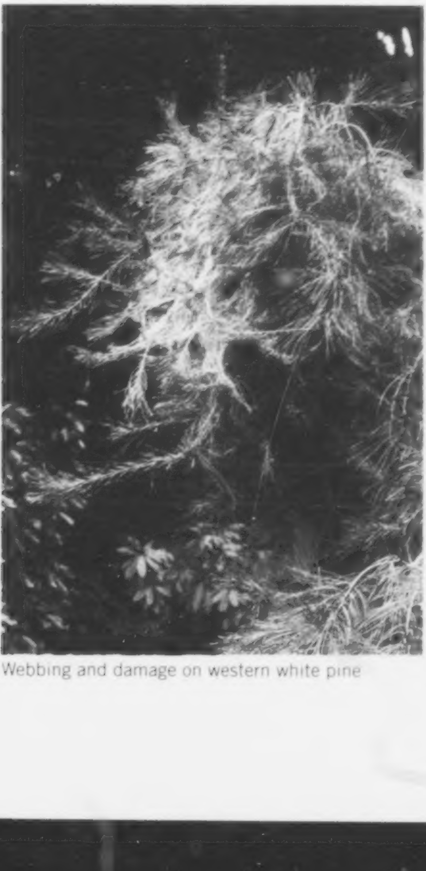
Bionomics: This species overwinters as a prepupal larva in earthen cells. Adults emerge in spring or early summer and live about 5 days. Oviposition starts 2 days after emergence. Females can lay up to 24 eggs, in lots of 7 to 11, in 2 or 3 rows on the convex sides of 1-year-old needles. The female may spend several minutes probing with her long ovipositor before she cuts a slit in the needle. Eggs hatch in approximately 24 days. First-instar larvae migrate to the bases of the new shoots and feed on old needles from a small frass nest. Larvae eventually construct large frass-filled webs, and are active from June to July. Mature larvae drop to the soil from late July to August and construct earthen cells.

Damage: *Cephalcia californica* occasionally causes significant damage to pines planted in urban areas and also to lodgepole pine in seed orchards. Heavily infested trees may be covered with large unsightly webs that contain large accumulations of frass.

Similar species: No similar species occur on pine in British Columbia.



Mature (brown) and prepupal (green) larvae on frass nest



Webbing and damage on western white pine

Cephalcia fascipennis (Cresson)

Hosts: Engelmann spruce, white spruce and Sitka spruce.

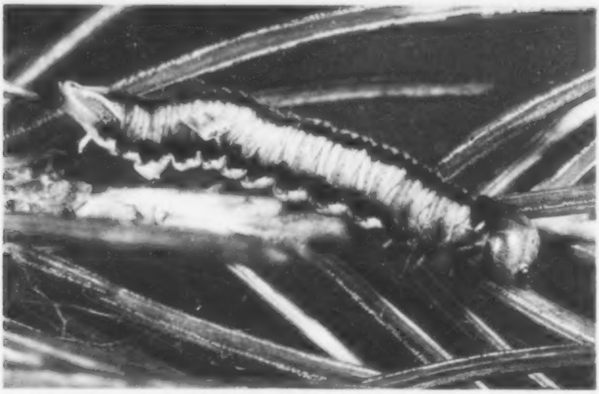
Distribution: South and central interior of British Columbia; east to Nova Scotia, and south to Maine.

Description: Mature larva up to 20 mm long. Head, light tan, with a pair of 7-segmented antennae and brown spotting over the crown. Body, yellowish brown; reddish brown middorsal, midventral and spiracular stripes. A pair of jointed appendages occurs at the posterior end.

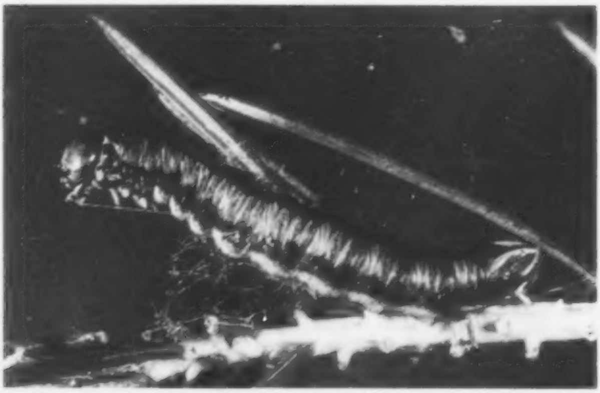
Bionomics: This species overwinters as a prepupal larva in earthen cells. Adults emerge in spring or early summer. The female begins laying eggs on the day of emergence, whether or not she is mated. Unfertilized eggs produce males; fertilized eggs produce females. Up to 23 shiny green cylindrical eggs are laid singly or end-to-end in rows of 2 to 4 on a needle. Larvae emerge in 18 to 24 days and construct shelters from silk and frass in the crotches of twigs or branches. The larvae forage from these shelters by cutting the older needles and eating them from the base outward. Tips of needles are not usually eaten and may be incorporated into the shelters. The mature larvae drop to the soil in late July or August, burrow to a depth of 5 to 8 cm, then construct earthen cells.

Damage: *Cephalcia fascipennis* is a solitary web-spinning sawfly which occasionally causes noticeable damage to ornamental spruce trees or hedges. Outbreaks occasionally occur in seed orchards or on trees growning in open, park-like settings. Because spruce retain their needles for 5 or more years, it takes as long for a seriously damaged tree to regain its normal appearance.

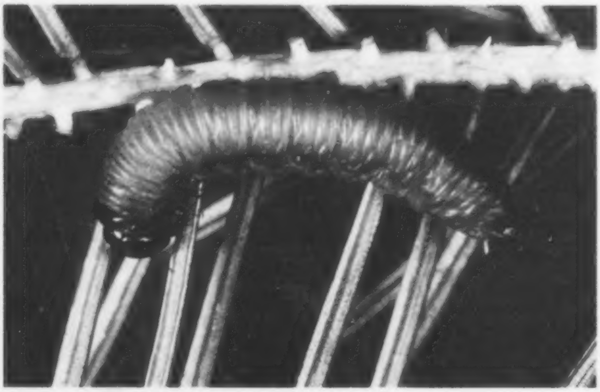
Similar species: This species is similar to *Cephalcia provancheri* (Huard), which was not collected during this study. Adults should be reared from larvae to confirm identification.



Dorso-lateral view of mature larva on Engelmann spruce



Lateral view of mature larva on Engelmann spruce



Dorso-lateral view of prepupal larva on Sitka spruce

Anoplonyx laricivorus (Rohwer and Middleton)
Twolined larch sawfly

Host: Western larch.

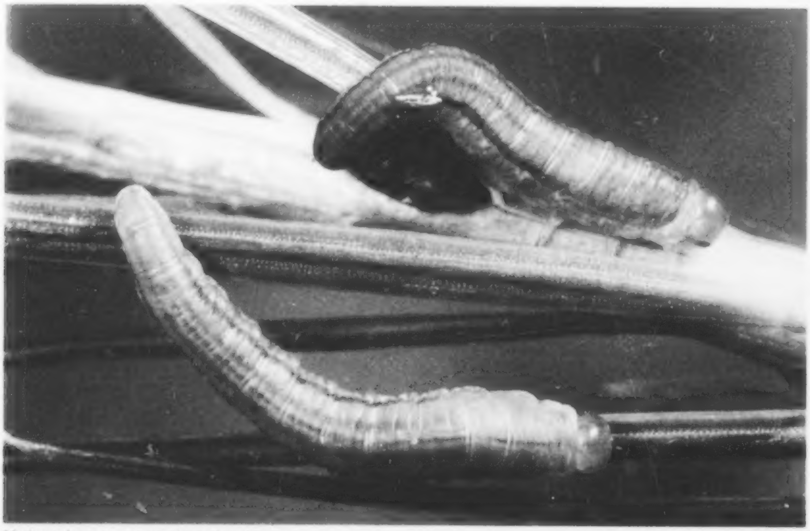
Distribution: Throughout the host range in British Columbia; south to Oregon and Montana.

Description: Mature larva up to 14 mm long. Head, yellowish brown with black eyes. Body, green; tapered towards the hind end with the thorax larger than the abdomen; grey, somewhat faint, middorsal and subdorsal stripes; dark supraspiracular stripe. Seven pairs of abdominal prolegs.

Bionomics: This species overwinters as a prepupal larva in a cocoon buried in the soil. Adults emerge in late May to June, and the females lay eggs, usually singly, in slits cut into needles. Larvae are present from mid-June to July. Mature larvae drop to the ground and spin cocoons in late July or August.

Damage: The twolined larch sawfly is a common, occasionally abundant, and rarely destructive defoliator. Damaging outbreaks are not known to have occurred in British Columbia, but have been recorded in Idaho and Montana.

Similar species: No similar species occur on western larch in British Columbia.



Mature larvae on western larch

Anoplonyx luteipes (Cresson)
Threelined larch sawfly

Host: Tamarack.

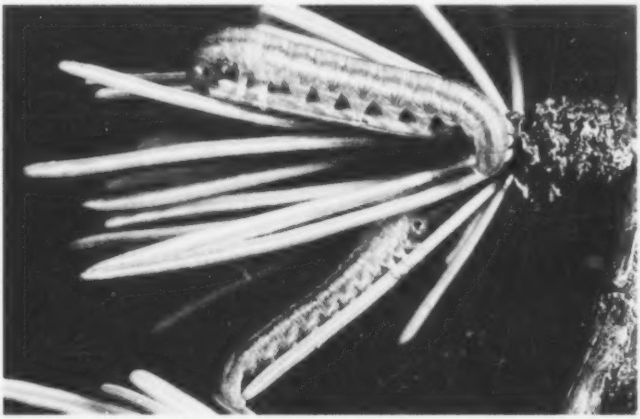
Distribution: Northeast British Columbia (east of the Rocky Mountains); east to Newfoundland, north to the Yukon and Northwest Territories, and south to Maine and Minnesota.

Description: Mature larva up to 15 mm long. Head, yellowish brown with black eyes. Body, green; tapered toward the hind end with the thorax larger than the abdomen; faint middorsal pinstripe; well-defined olive green addorsal, supraspiracular, and subspiracular stripes. Seven pairs of abdominal prolegs.

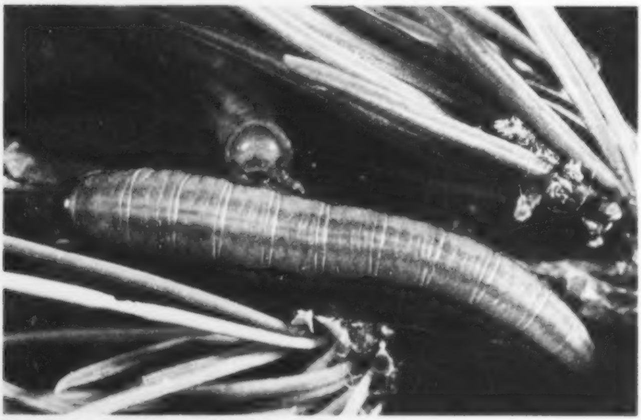
Bionomics: This species overwinters as a prepupal larva in a cocoon buried in the soil. Adults emerge in late May, and the females lay eggs, usually singly, in slits cut into the needles. Larvae are present from mid-June to July. Mature larvae drop to the ground and spin cocoons in late July.

Damage: *Anoplonyx luteipes* is a common solitary sawfly. Although occasionally locally abundant on individual trees, damaging outbreaks have not been recorded in British Columbia.

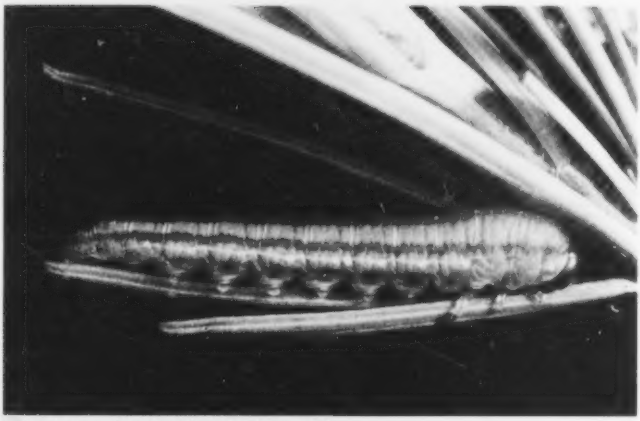
Similar species: No similar species occur on tamarack in British Columbia.



Mature larvae feeding on tamarack



Dorsal view of mature larva on tamarack.



Lateral view of mature larva on tamarack

Anoplonyx occidens Ross
Western larch sawfly

Host: Western larch.

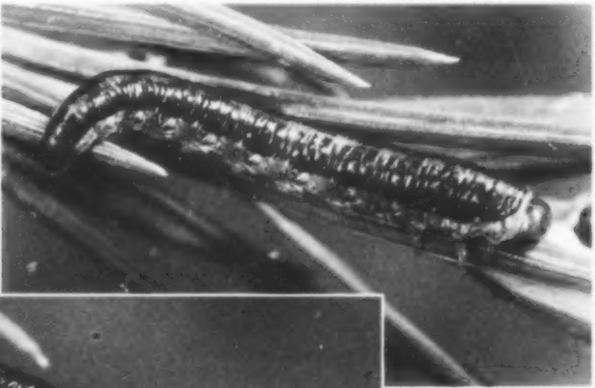
Distribution: Throughout the host range in British Columbia; south to Washington and Montana.

Description: Mature larva up to 21 mm long. Head, brown with black eyes. Body, cream colored; broad grey subdorsal stripes. Seven pairs of abdominal prolegs.

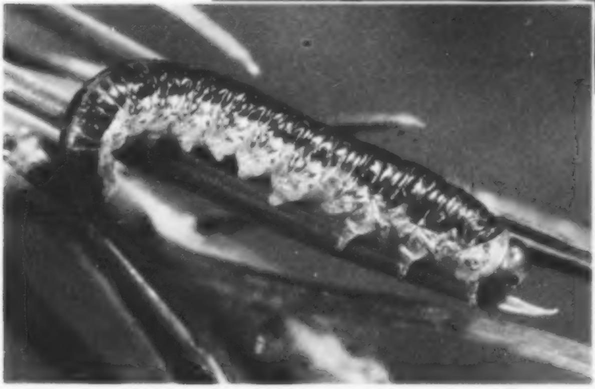
Bionomics: This species overwinters as a prepupal larva in a cocoon buried in the soil. Adults emerge from late May to June, and the females lay eggs, usually singly, in slits cut into needles. Larvae are present from mid-June to July. Mature larvae drop to the ground and spin cocoons in late July or August.

Damage: The western larch sawfly is a common, frequently abundant, and rarely destructive defoliator. Damaging outbreaks have been recorded in Idaho and Montana, but are not known to have occurred in British Columbia.

Similar species: No similar species occur on western larch in British Columbia.



Dorso-lateral view of mature larva on western larch



Lateral view of mature larva on western larch

Pikonema alaskensis (Rohwer)
Yellowheaded spruce sawfly

Hosts: Engelmann spruce, white spruce, Sitka spruce, black spruce and blue spruce.

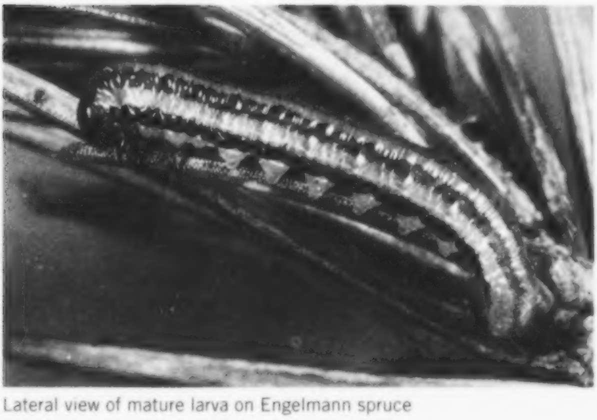
Distribution: Generally distributed throughout British Columbia; east to Newfoundland, north to Alaska, and south to Massachusetts, Minnesota and Washington.

Description: Mature larva up to 20 mm long. Head, chestnut brown. Body, brownish yellow; paired greyish green middorsal and subdorsal stripes; broad, grey subspiracular stripe. Seven pairs of abdominal prolegs.

Bionomics: This species overwinters as a prepupal larva in a cocoon buried in the duff or subsoil. Adults emerge in May and lay about 80 eggs on the new flush. Larvae initially feed in groups on current-year needles, then move onto older needles. Larvae are present from mid-June to July, at which time they drop to the ground and spin overwintering cocoons.

Damage: In British Columbia, the yellowheaded spruce sawfly is a common, nondestructive defoliator in the natural forest. However, it often goes into outbreak on open-grown spruce that have been planted as ornamentals on urban properties or as shelterbelts on farms.

Similar species: No similar species occur on spruce in British Columbia.



Lateral view of mature larva on Engelmann spruce

Pikonema dimmocki (Cresson)
Greenheaded spruce sawfly

Hosts: Engelmann spruce, white spruce, Sitka spruce, black spruce and blue spruce.

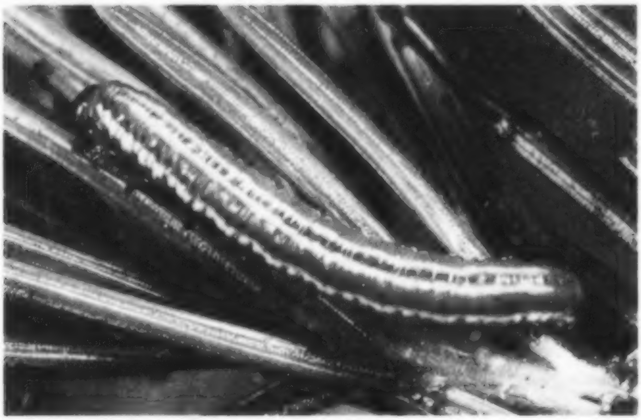
Distribution: Generally distributed throughout British Columbia; east to Newfoundland, north to Alaska, and south to Colorado.

Description: Mature larva up to 20 mm long. Head, green; black dashes on the vertex and cheeks. Body, green; prominent white addorsal and spiracular stripes. Seven pairs of abdominal prolegs.

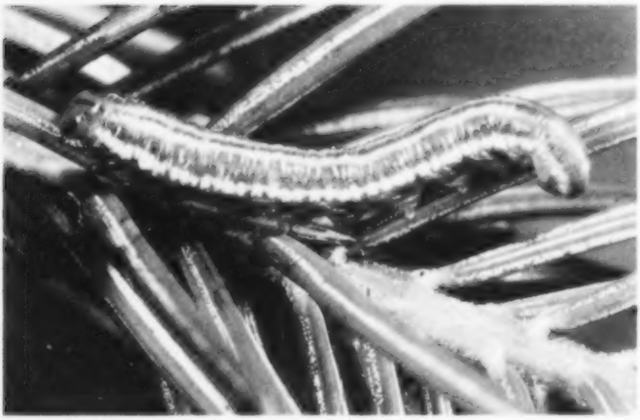
Bionomics: This species overwinters as a prepupal larva in a cocoon buried in the duff or subsoil. Adults emerge in May and lay their eggs on the new flush. Larvae initially feed on current-year needles, then move onto older needles. Larvae are active from mid-June to July, at which time they drop to the ground and spin overwintering cocoons.

Damage: The greenheaded spruce sawfly is a common, innocuous, solitary defoliator. It is frequently found together with the yellowheaded spruce sawfly, but is less damaging.

Similar species: No similar species occur on spruce in British Columbia.



Dorso-lateral view of mature larva on Engelmann spruce



Dorso-lateral view of mature larva on Engelmann spruce

Pristiphora erichsonii (Hartig)
Larch sawfly

Hosts: Western larch, tamarack and subalpine larch; also occurs on European larch, Japanese larch, Siberian larch and Dahurian larch planted in test plots or as ornamentals.

Distribution: Holarctic. This species occurs throughout the host range in British Columbia, and on larch planted as ornamentals on southeast Vancouver Island and in the Pemberton Valley. It occurs north to Alaska, east to Newfoundland, and south to Oregon and Maryland. It also occurs in Eurasia, including Japan.

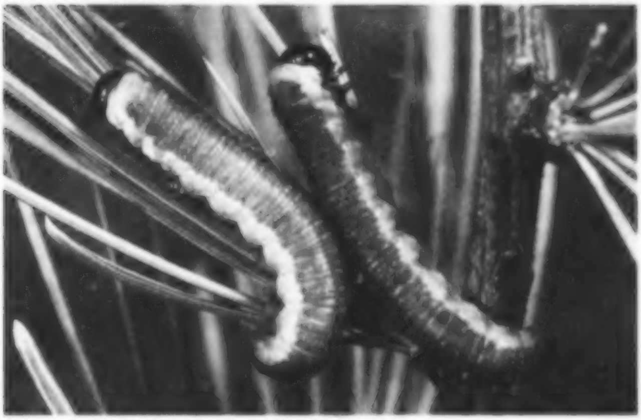
Description: Mature larva up to 16 mm long. Head and thoracic legs, black. Body, greyish green above the spiracular line and light grey below. Seven pairs of abdominal prolegs.

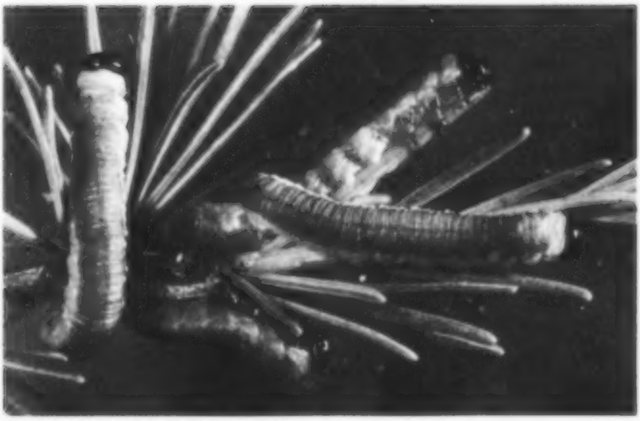
Bionomics: This species overwinters as a prepupal larva in a cocoon buried in the duff. Pupation and adult emergence occur the following spring. A few individuals may diapause for 1 or more years. Females emerge during May and June, and lay about 75 eggs in small slits along one side of an elongating shoot. Oviposition damage causes the shoot to curl in a characteristic manner. Larvae feed gregariously on needle clusters from May to July, stripping foliage from entire branches. Mature larvae drop to the ground between June and July, and spin cocoons in the duff.

Damage: The larch sawfly is the most destructive defoliator of larch. It was first observed in British Columbia near Fernie in 1930, and had spread to the West Kootenay by 1935, to the north Okanagan by 1941, and north to Fort Nelson by 1952. An outbreak covering 130 000 ha occurred in the East Kootenay from 1964 to 1967; a second, smaller outbreak covering 12 000 ha occurred in this area from 1982 to 1983.

Larch is deciduous and can withstand defoliation better than most conifers; however, repeated defoliation over many years may result in growth reduction, tip dieback, branch mortality and tree mortality.

Similar species: No similar species occur on larch in British Columbia.


Mature larvae feeding on western larch


Mature larvae feeding on tamarack

Pristiphora leechi (Wong & Ross)

Host: Western larch.

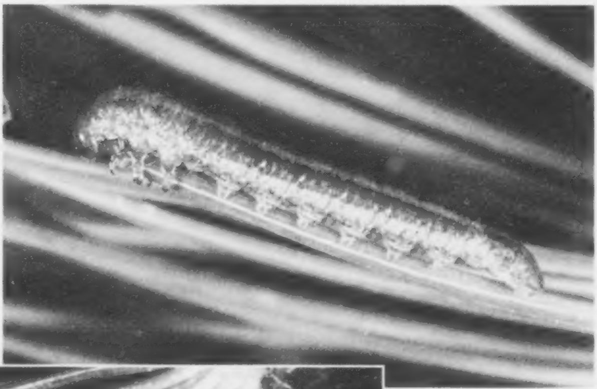
Distribution: Throughout the host range in British Columbia; south to Washington and Montana.

Description: Mature larva up to 13 mm long. Head, green with black eyespots. Body, yellowish green; narrow dark green middorsal stripe; broad green subdorsal stripe.

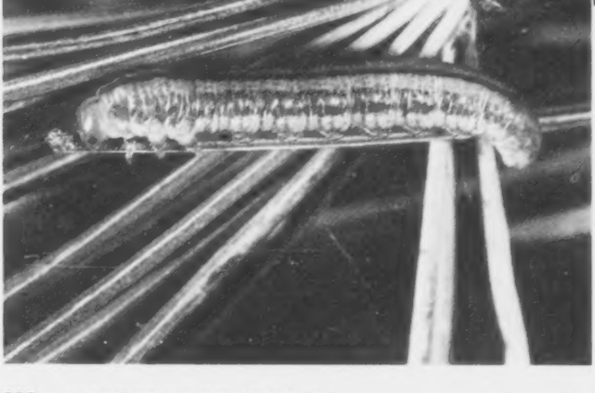
Bionomics: Appears to overwinter in the egg stage. Larvae are present May to late June. Pupation occurs in late June. Adults emerge in mid-July.

Damage: *Pristiphora leechi* is a common, innocuous, solitary defoliator.

Similar species: No similar species occur on western larch in British Columbia.



Lateral view of mature larva feeding on western larch



Dorso-lateral view of mature larva feeding on western larch

Glossary

Addorsal	a little to one side of the middorsal line
Adfrontal suture	line dividing the front of a caterpillar head capsule
Bionomics	life history and habits of an organism
Cleft	notched
Cocoon	spun-silk enclosure around pupa
Cryptic	color pattern blends with background foliage or twig
Defoliator	insect that consumes plant foliage
Diapause	period of arrested development
Dorso-lateral	including both dorsum and side
Dorsal	upper surface of a larva
Dorsum	upper side of a larva
Ecdysis	shedding skin; molting
Entomopathogen	a bacterium, virus or fungus that causes disease in insects
Form	a color pattern variation that is different from what is normal
Frass	pellet-like larval droppings
Frontal triangle	triangular area in center of head
Instar	one of the larval stages between molts; there are usually 5 or 6 instars
Integument	outer covering (skin) of larva
Hibernaculum	overwintering shelter
Holarctic	temperate regions of Northern Hemisphere
Labrum	lip-like plate above the mouth
Larva	immature feeding stage of moths, butterflies and sawflies
Lateral	along the sides of body
Lateral flange	projecting lateral ridge
Line	fine longitudinal stripe
Maculation	spotting or markings
Mature larva	last larval instar before pupation
Middorsal	along the dorsal midline
Monophagous	feeds on plants of a single species or genus
Netting	covered with net-like markings

Glossary

Obtect	type of insect pupa where the appendages are visible, appressed flat against the pupal case
Parasitoid	an insect predator that completes its development on or in a single host and kills the host
Penultimate-instar larva	second to last larval instar before pupation
Pheromone	a chemical substance secreted by an organism that influences the behavior of others of the same species
Pinaculum	a round dark- or light-colored plate that bears a seta
Polyphagous	feeds on many plant species
Prepupal larva	non-feeding mature larva; usually has a changed color and shape
Prolegs	fleshy, unjointed abdominal legs of caterpillars and sawfly larvae
Prothoracic shield	sclerotized plate over first thoracic segment
Setae	hairs
Spiracles	external openings of the respiratory system along sides of larva
Spiracular	passing longitudinally along spiracles
Stripe	broad longitudinal line
Subdorsal	along the side of a dorsum
Subspiracular	below the level of the spiracles
Supraspiracular	above the level of the spiracles
Teneral	recently molted condition
Tubercles	small fleshy lobes or protuberances on body
Tussocks	dense, brush-like tufts of setae
Univoltine	one generation each year
Ventral	underside of body
Verruca	tubercle that bears tufts of setae
Vertex	upper side of head

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Species not collected

The following species were either not found or not successfully reared to the adult stage during the term of this project and are not included in this edition:

Abagrotis turbulenta McDunnough

Acantholyda brunnicans (Norton)

Archips striana (Fernald)

Cephalcia provancheri (Huard)

Coleotechnites occidentis (Freeman)

Cosmia elisae Lafontaine & Troubridge

Hydriomena albimontanata McDunnough

Hydriomena californiata Packard

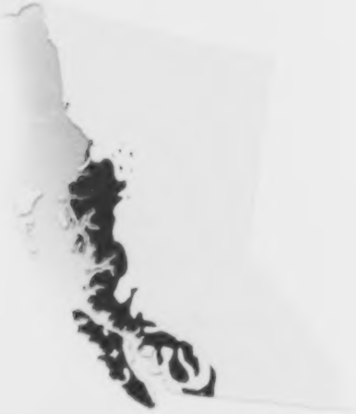
Hydriomena marinata Barnes & McDunnough

Stenoporpia separataria (Grote)

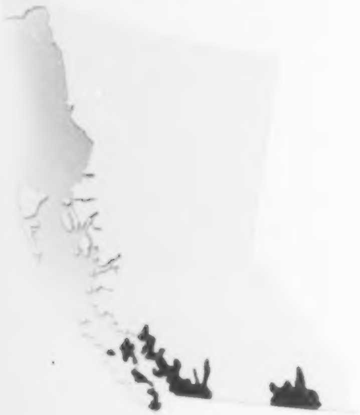
Susana fuscala (Wong & Ross)

Host distribution maps

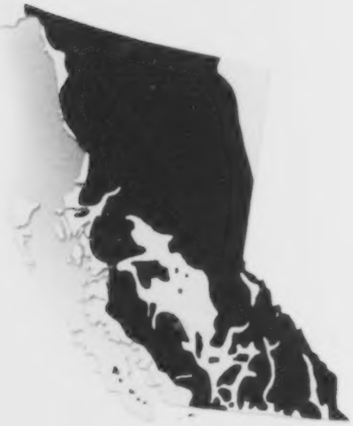
Distribution Maps of Native Conifers of British Columbia



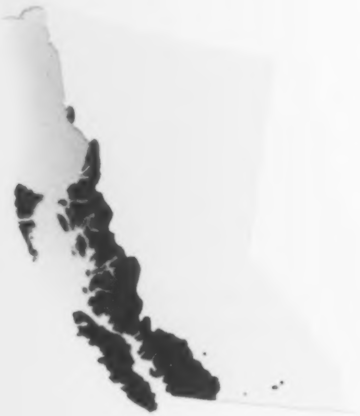
Amabilis fir
Abies amabilis (Dougl. ex Loud.)
Dougl. Ex J. Forbes



Grand fir
Abies grandis (Dougl. ExD. Don) Lindl.

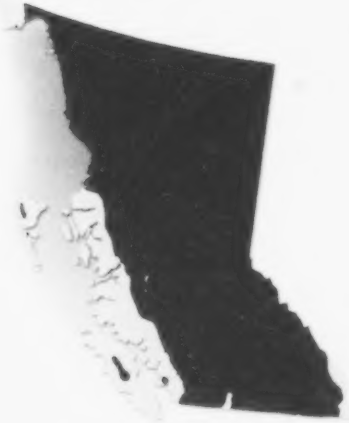


Subalpine fir
Abies lasiocarpa (Hook.) Nutt.

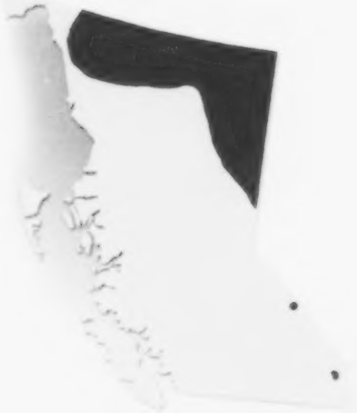


Yellow-cedar
Chamaecyparis nootkatensis (D. Don) Spach

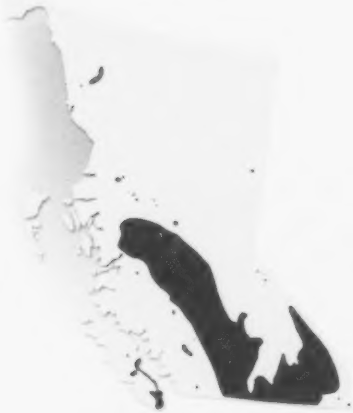
Host distribution maps



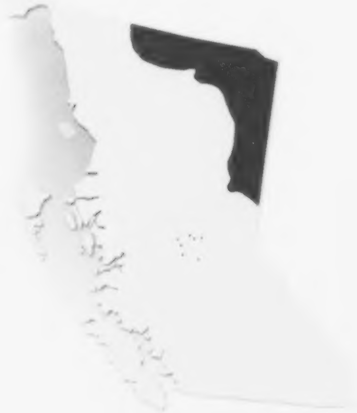
Common juniper
Juniperus communis L.



Creeping juniper
Juniperus horizontalis Moench

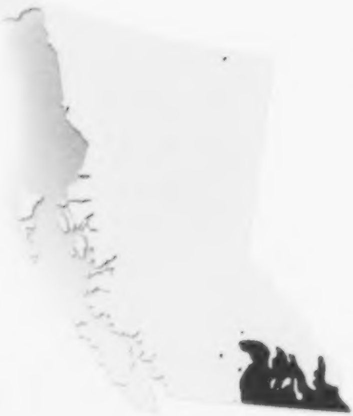


Rocky Mountain juniper
Juniperus scopulorum Sarg.

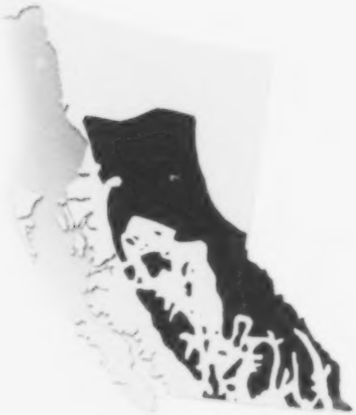


Tamarack
Larix laricina (Du Roi) K. Koch

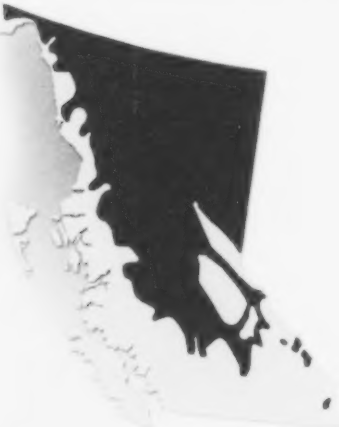
Subalpine larch
Larix lyalli Parl.



Western larch
Larix occidentalis Nutt.

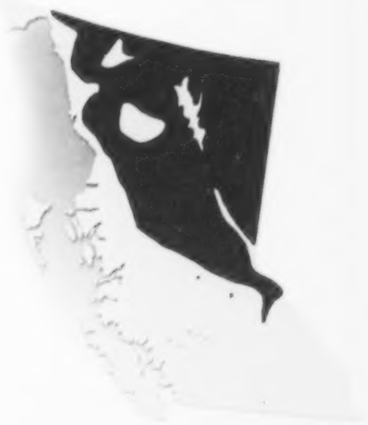


Engelmann spruce
Picea engelmanni Parry ex Engelm.

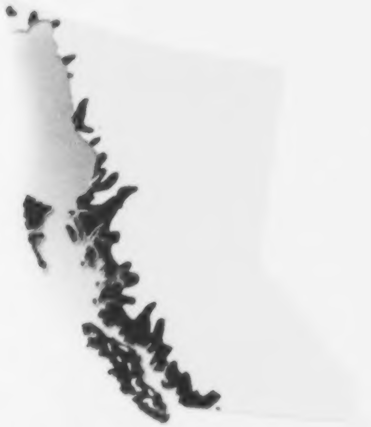


White spruce
Picea glauca (Moench) Voss

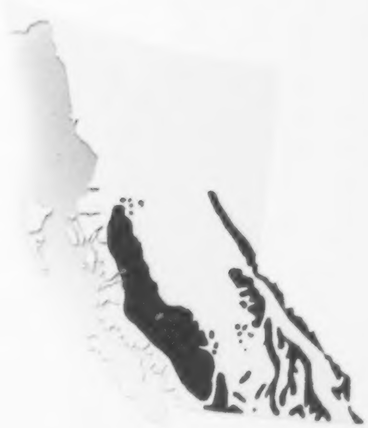
Host distribution maps



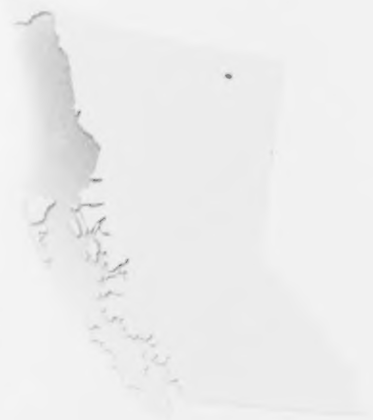
Black spruce
Picea mariana (Mill.) BSP



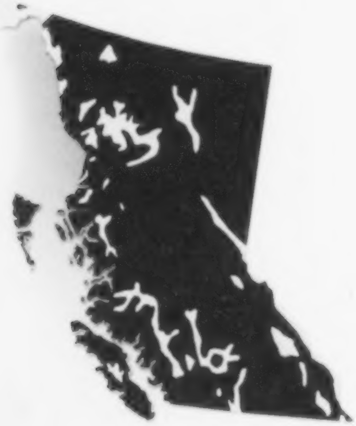
Sitka spruce
Picea sitchensis (Bong.) Carriere



Whitebark pine
Pinus albicaulis Engelm.

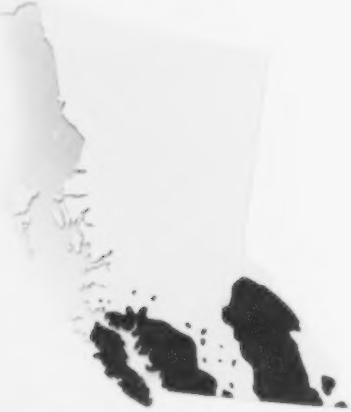


Jack pine
Pinus banksiana Lamb.

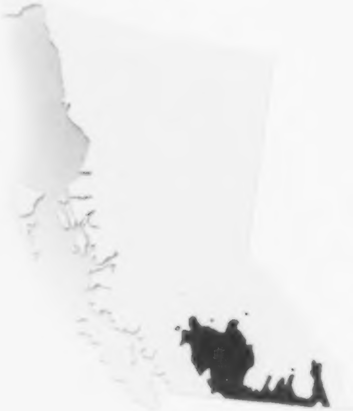


Lodgepole pine
Pinus contorta Dougl. ex Loud.

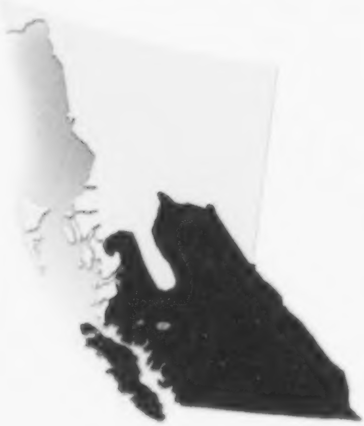
Limber pine
Pinus flexilis James



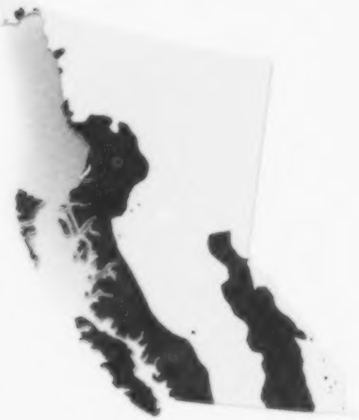
Western white pine
Pinus monticola Dougl. ex D. Don



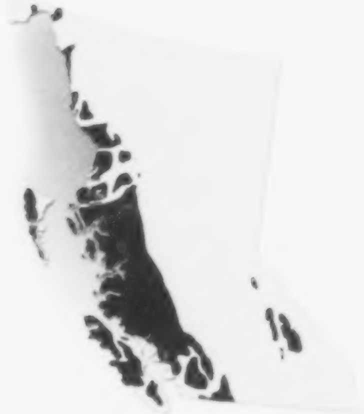
Ponderosa pine
Pinus ponderosa P. Laws. Ex C. Laws.



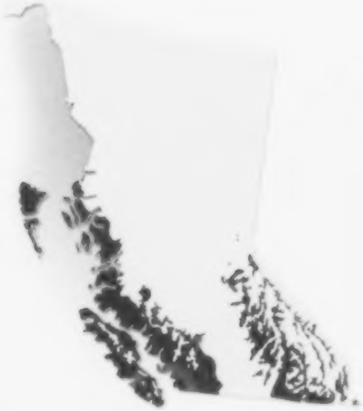
Douglas-fir
Pseudotsuga menziesii (Mirb.) Franco



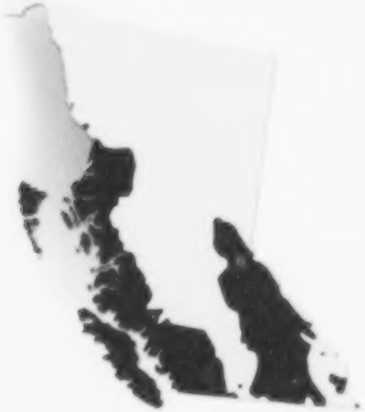
Western hemlock
Tsuga heterophylla (Raf.) Sarg.



Mountain hemlock
Tsuga mertensiana (Bong.) Carrier



Western yew
Taxus brevifolia Nutt.



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